# Department of Defense
# Fiscal Year (FY) 2021 Budget Estimates

February 2020

## Office of the Secretary Of Defense

*Defense-Wide Justification Book Volume 3 of 5*

***Research, Development, Test & Evaluation, Defense-Wide***

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## Table of Volumes

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## Office of the Secretary of Defense (OSD) RDT&E Overview

This account funds various Research, Development, Test and Evaluation (RDT&E) Defense-Wide (DW) programs under the purview of the Office of the Secretary of Defense (OSD) and provides technical support to the staff offices of the Secretary of Defense.

The OSD RDT&E DW budget provides ongoing support and oversight of research, development, and testing for the Office of the Secretary of Defense (OSD) Principal Staff Assistants (PSA), Military Services and other DoD agencies while eliminating duplication of efforts. It represents requirements from the Services that have been coordinated with appropriate Office of the Secretary of Defense (OSD) organizations.

The OSD RDT&E budget includes over 100 Program Elements (PEs) in eight budget activities (BA 1-8) ranging from basic research to full scale operational system development and the newly established Software Pilot Program. This budget request consists of programs such as hypersonics, artificial intelligence, directed energy, manufacturing institutes, quantum science, combating and countering terrorism, wargaming, microelectronics, 5G Next Generation Communication, physical security, cyber security, systems engineer, small business interests among many more.

Budget Activities 1, 2 and 3 consists of Science and Technology (S&T) - Basic Research, Applied Research, and Advanced Technology Development which allows the Department of Defense (DoD) to conduct research in areas important to U.S. military capabilities and drives long-term innovation. Approximately 30% of the FY 21 OSD RDT&E President's Budget request is in Science and Technology. Colleges and universities as well as innovation and technology are key performers of the S&T activities. These include programs such as research grants, STEM education, laboratory research, innovation & technology, artificial intelligence, directed energy, Defense Modernization, etc. The remainder of the RDT&E, budget (budget activities 4, 5, 6, 7) is dedicated to military intelligence, information and weapon systems, technology development, sustainment and support and other various efforts while Budget Activity 08 contains Software & Digital Technology Pilot programs.

The OSD RDT&E Program is committed to and has achieved numerous milestones and individual accomplishments which are presented in the FY 2021 President's Budget justification book.

The FY 21 OSD RDT&E budget includes programs supporting offices of the Secretary of Defense, the Deputy Secretary of Defense and Under Secretaries of Defense, which are listed below:

Office of the Chief Management Officer (O,CMO)
Office of the Under Secretary of Defense for Acquisition and Sustainment (OUSD(A&S))
Office of the Under Secretary of Defense for Research and Engineering (OUSD(R&E))
Office of the Under Secretary of Defense for Policy (OUSD(P))
Office of the Under Secretary of Defense Comptroller (OUSD(C))
Office of the Under Secretary for Personnel and Readiness (OUSD(P&R))
Office of the Under Secretary for Intelligence (OUSD(I))
DoD Chief Information Officer (DoD CIO)
Director, Cost Assessment and Program Evaluation (D,CAPE)
Office of the Director of Net Assessment (ODNA)
Test Resource Management Center (TRMC)

The OSD RDT&E FY 2021 funding request was reduced by $499.4 million resulting from the Defense-Wide Review (DWR), which focused on the Secretary's guidance to streamline operations, increase efficiency, and promote greater affordability within the OSD and Defense Agencies and Field Activities in order to ensure the Department's optimum alignment to the National Defense Strategy and DoD strategic guidance, with particular focus on building a more lethal, resilient, agile, and ready force while strengthening alliances, prioritizing cyber and space capabilities, and focusing on innovation to maintain the technological advantage."

FY 2021 OSD RDT&E President’s Budget request is approximately $4.7 billion.

Department of Defense
FY 2021President's Budget
Exhibit R-1 FY 2021 President's Budget
Total Obligational Authority
(Dollars in Thousands)

03 Feb 2020

| Appropriation | FY 2019 (Base + OCO) | FY 2020 Base Enacted | FY 2020 Emergency | FY 2020 OCO Enacted | FY 2020 Total Enacted (Base+Emerg+ OCO) |
|---|---|---|---|---|---|
| Research, Development, Test & Eval, DW | 5,984,436 | 5,827,044 | | 25,230 | 5,852,274 |
| Total Research, Development, Test & Evaluation | 5,984,436 | 5,827,044 | | 25,230 | 5,852,274 |

Department of Defense
FY 2021President's Budget
Exhibit R-1 FY 2021 President's Budget
Total Obligational Authority
(Dollars in Thousands)

03 Feb 2020

| Appropriation | FY 2021 Base | FY 2021 OCO for Base Requirements | FY 2021 OCO for Direct War and Enduring Costs | FY 2021 Total OCO | FY 2021 Total (Base + OCO) |
|---|---|---|---|---|---|
| Research, Development, Test & Eval, DW | 4,772,874 | | 19,288 | 19,288 | 4,792,162 |
| Total Research, Development, Test & Evaluation | 4,772,874 | | 19,288 | 19,288 | 4,792,162 |

Department of Defense
FY 2021President's Budget
Exhibit R-1 FY 2021 President's Budget
Total Obligational Authority
(Dollars in Thousands)

03 Feb 2020

| Summary Recap of Budget Activities | FY 2019 (Base + OCO) | FY 2020 Base Enacted | FY 2020 Emergency | FY 2020 OCO Enacted | FY 2020 Total Enacted (Base+Emerg+ OCO) |
|---|---|---|---|---|---|
| Basic Research | 226,506 | 267,656 | | | 267,656 |
| Applied Research | 151,817 | 166,721 | | | 166,721 |
| Advanced Technology Development | 1,316,889 | 1,437,142 | | 25,230 | 1,462,372 |
| Advanced Component Development & Prototypes | 2,512,642 | 2,247,814 | | | 2,247,814 |
| System Development & Demonstration | 712,358 | 441,579 | | | 441,579 |
| Management Support | 1,042,254 | 1,051,810 | | | 1,051,810 |
| Operational Systems Development | 21,970 | 214,322 | | | 214,322 |
| Software And Digital Technology Pilot Programs | | | | | |
| Total Research, Development, Test & Evaluation | 5,984,436 | 5,827,044 | | 25,230 | 5,852,274 |
| **Summary Recap of FYDP Programs** | | | | | |
| General Purpose Forces | 9,892 | 8,037 | | | 8,037 |
| Intelligence and Communications | 287,500 | 384,982 | | | 384,982 |
| Research and Development | 5,686,075 | 5,434,025 | | 25,230 | 5,459,255 |
| Administration and Associated Activities | 969 | | | | |
| Total Research, Development, Test & Evaluation | 5,984,436 | 5,827,044 | | 25,230 | 5,852,274 |

Department of Defense
FY 2021President's Budget
Exhibit R-1 FY 2021 President's Budget
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(Dollars in Thousands)

03 Feb 2020

| Summary Recap of Budget Activities | FY 2021 Base | FY 2021 OCO for Base Requirements | FY 2021 OCO for Direct War and Enduring Costs | FY 2021 Total OCO | FY 2021 Total (Base + OCO) |
|---|---|---|---|---|---|
| Basic Research | 166,781 | | | | 166,781 |
| Applied Research | 181,039 | | | | 181,039 |
| Advanced Technology Development | 1,085,375 | | 19,288 | 19,288 | 1,104,663 |
| Advanced Component Development & Prototypes | 2,005,079 | | | | 2,005,079 |
| System Development & Demonstration | 230,402 | | | | 230,402 |
| Management Support | 731,306 | | | | 731,306 |
| Operational Systems Development | 105,937 | | | | 105,937 |
| Software And Digital Technology Pilot Programs | 266,955 | | | | 266,955 |
| Total Research, Development, Test & Evaluation | 4,772,874 | | 19,288 | 19,288 | 4,792,162 |
| **Summary Recap of FYDP Programs** | | | | | |
| General Purpose Forces | 3,099 | | | | 3,099 |
| Intelligence and Communications | 353,704 | | | | 353,704 |
| Research and Development | 4,416,071 | | 19,288 | 19,288 | 4,435,359 |
| Administration and Associated Activities | | | | | |
| Total Research, Development, Test & Evaluation | 4,772,874 | | 19,288 | 19,288 | 4,792,162 |

Defense-Wide
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| Summary Recap of Budget Activities | FY 2019 (Base + OCO) | FY 2020 Base Enacted | FY 2020 Emergency | FY 2020 OCO Enacted | FY 2020 Total Enacted (Base+Emerg+ OCO) |
|---|---|---|---|---|---|
| Basic Research | 226,506 | 267,656 | | | 267,656 |
| Applied Research | 151,817 | 166,721 | | | 166,721 |
| Advanced Technology Development | 1,316,889 | 1,437,142 | | 25,230 | 1,462,372 |
| Advanced Component Development & Prototypes | 2,512,642 | 2,247,814 | | | 2,247,814 |
| System Development & Demonstration | 712,358 | 441,579 | | | 441,579 |
| Management Support | 1,042,254 | 1,051,810 | | | 1,051,810 |
| Operational Systems Development | 21,970 | 214,322 | | | 214,322 |
| Software And Digital Technology Pilot Programs | | | | | |
| Total Research, Development, Test & Evaluation | 5,984,436 | 5,827,044 | | 25,230 | 5,852,274 |
| **Summary Recap of FYDP Programs** | | | | | |
| General Purpose Forces | 9,892 | 8,037 | | | 8,037 |
| Intelligence and Communications | 287,500 | 384,982 | | | 384,982 |
| Research and Development | 5,686,075 | 5,434,025 | | 25,230 | 5,459,255 |
| Administration and Associated Activities | 969 | | | | |
| Total Research, Development, Test & Evaluation | 5,984,436 | 5,827,044 | | 25,230 | 5,852,274 |

Defense-Wide
FY 2021President's Budget
Exhibit R-1 FY 2021 President's Budget
Total Obligational Authority
(Dollars in Thousands)

03 Feb 2020

| Summary Recap of Budget Activities | FY 2021 Base | FY 2021 OCO for Base Requirements | FY 2021 OCO for Direct War and Enduring Costs | FY 2021 Total OCO | FY 2021 Total (Base + OCO) |
|---|---|---|---|---|---|
| Basic Research | 166,781 | | | | 166,781 |
| Applied Research | 181,039 | | | | 181,039 |
| Advanced Technology Development | 1,085,375 | | 19,288 | 19,288 | 1,104,663 |
| Advanced Component Development & Prototypes | 2,005,079 | | | | 2,005,079 |
| System Development & Demonstration | 230,402 | | | | 230,402 |
| Management Support | 731,306 | | | | 731,306 |
| Operational Systems Development | 105,937 | | | | 105,937 |
| Software And Digital Technology Pilot Programs | 266,955 | | | | 266,955 |
| Total Research, Development, Test & Evaluation | 4,772,874 | | 19,288 | 19,288 | 4,792,162 |
| **Summary Recap of FYDP Programs** | | | | | |
| General Purpose Forces | 3,099 | | | | 3,099 |
| Intelligence and Communications | 353,704 | | | | 353,704 |
| Research and Development | 4,416,071 | | 19,288 | 19,288 | 4,435,359 |
| Administration and Associated Activities | | | | | |
| Total Research, Development, Test & Evaluation | 4,772,874 | | 19,288 | 19,288 | 4,792,162 |

Defense-Wide
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(Dollars in Thousands)

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| Appropriation | FY 2019 (Base + OCO) | FY 2020 Base Enacted | FY 2020 Emergency | FY 2020 OCO Enacted | FY 2020 Total Enacted (Base+Emerg+ OCO) |
|---|---|---|---|---|---|
| Office of Secretary of Defense | 5,984,436 | 5,827,044 | | 25,230 | 5,852,274 |
| Total Research, Development, Test & Evaluation | 5,984,436 | 5,827,044 | | 25,230 | 5,852,274 |

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FY 2021President's Budget
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(Dollars in Thousands)

03 Feb 2020

| Appropriation | FY 2021 Base | FY 2021 OCO for Base Requirements | FY 2021 OCO for Direct War and Enduring Costs | FY 2021 Total OCO | FY 2021 Total (Base + OCO) |
|---|---|---|---|---|---|
| Office of Secretary of Defense | 4,772,874 | | 19,288 | 19,288 | 4,792,162 |
| Total Research, Development, Test & Evaluation | 4,772,874 | | 19,288 | 19,288 | 4,792,162 |

Defense-Wide
FY 2021President's Budget
Exhibit R-1 FY 2021 President's Budget
Total Obligational Authority
(Dollars in Thousands)

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Appropriation: 0400D Research, Development, Test & Eval, DW

| Line No | Program Element Number | Item | Act | FY 2019 (Base + OCO) | FY 2020 Base Enacted | FY 2020 Emergency | FY 2020 OCO Enacted | FY 2020 Total Enacted (Base+Emerg+ OCO) | Sec |
|---|---|---|---|---|---|---|---|---|---|
| 3 | 0601110D8Z | Basic Research Initiatives | 01 | 55,195 | 70,874 | | | 70,874 | U |
| 5 | 0601120D8Z | National Defense Education Program | 01 | 132,743 | 144,074 | | | 144,074 | U |
| 6 | 0601228D8Z | Historically Black Colleges and Universities/Minority Institutions | 01 | 38,568 | 52,708 | | | 52,708 | U |
| | | Basic Research | | 226,506 | 267,656 | | | 267,656 | |
| 8 | 0602000D8Z | Joint Munitions Technology | 02 | 19,067 | 19,306 | | | 19,306 | U |
| 11 | 0602230D8Z | Defense Technology Innovation | 02 | | | | | | U |
| 12 | 0602234D8Z | Lincoln Laboratory Research Program | 02 | 49,647 | 52,317 | | | 52,317 | U |
| 13 | 0602251D8Z | Applied Research for the Advancement of S&T Priorities | 02 | 59,567 | 60,400 | | | 60,400 | U |
| 17 | 0602668D8Z | Cyber Security Research | 02 | 14,594 | 25,118 | | | 25,118 | U |
| 22 | 0602751D8Z | Software Engineering Institute (SEI) Applied Research | 02 | 8,942 | 9,580 | | | 9,580 | U |
| | | Applied Research | | 151,817 | 166,721 | | | 166,721 | |
| 24 | 0603000D8Z | Joint Munitions Advanced Technology | 03 | 25,462 | 25,779 | | | 25,779 | U |
| 25 | 0603121D8Z | SO/LIC Advanced Development | 03 | | 5,000 | | | 5,000 | U |
| 26 | 0603122D8Z | Combating Terrorism Technology Support | 03 | 168,012 | 91,517 | | 25,230 | 116,747 | U |
| 27 | 0603133D8Z | Foreign Comparative Testing | 03 | 23,867 | 24,970 | | | 24,970 | U |
| 33 | 0603225D8Z | Joint DoD-DoE Munitions Technology Development | 03 | 17,941 | 18,773 | | | 18,773 | U |
| 36 | 0603288D8Z | Analytic Assessments | 03 | 17,768 | 18,429 | | | 18,429 | U |

Defense-Wide
FY 2021President's Budget
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(Dollars in Thousands)

03 Feb 2020

Appropriation: 0400D Research, Development, Test & Eval, DW

| Line No | Program Element Number | Item | Act | FY 2021 Base | FY 2021 OCO for Base Requirements | FY 2021 OCO for Direct War and Enduring Costs | FY 2021 Total OCO | FY 2021 Total (Base + OCO) | Sec |
|---|---|---|---|---|---|---|---|---|---|
| 3 | 0601110D8Z | Basic Research Initiatives | 01 | 35,565 | | | | 35,565 | U |
| 5 | 0601120D8Z | National Defense Education Program | 01 | 100,241 | | | | 100,241 | U |
| 6 | 0601228D8Z | Historically Black Colleges and Universities/Minority Institutions | 01 | 30,975 | | | | 30,975 | U |
| | | Basic Research | | 166,781 | | | | 166,781 | |
| 8 | 0602000D8Z | Joint Munitions Technology | 02 | 19,409 | | | | 19,409 | U |
| 11 | 0602230D8Z | Defense Technology Innovation | 02 | 35,000 | | | | 35,000 | U |
| 12 | 0602234D8Z | Lincoln Laboratory Research Program | 02 | 41,080 | | | | 41,080 | U |
| 13 | 0602251D8Z | Applied Research for the Advancement of S&T Priorities | 02 | 60,722 | | | | 60,722 | U |
| 17 | 0602668D8Z | Cyber Security Research | 02 | 15,255 | | | | 15,255 | U |
| 22 | 0602751D8Z | Software Engineering Institute (SEI) Applied Research | 02 | 9,573 | | | | 9,573 | U |
| | | Applied Research | | 181,039 | | | | 181,039 | |
| 24 | 0603000D8Z | Joint Munitions Advanced Technology | 03 | 22,920 | | | | 22,920 | U |
| 25 | 0603121D8Z | SO/LIC Advanced Development | 03 | 4,914 | | | | 4,914 | U |
| 26 | 0603122D8Z | Combating Terrorism Technology Support | 03 | 51,089 | | 19,288 | 19,288 | 70,377 | U |
| 27 | 0603133D8Z | Foreign Comparative Testing | 03 | 25,183 | | | | 25,183 | U |
| 33 | 0603225D8Z | Joint DoD-DoE Munitions Technology Development | 03 | 18,873 | | | | 18,873 | U |
| 36 | 0603288D8Z | Analytic Assessments | 03 | 23,775 | | | | 23,775 | U |

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FY 2021President's Budget
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(Dollars in Thousands)

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Appropriation: 0400D Research, Development, Test & Eval, DW

| Line No | Program Element Number | Item | Act | FY 2019 (Base + OCO) | FY 2020 Base Enacted | FY 2020 Emergency | FY 2020 OCO Enacted | FY 2020 Total Enacted (Base+Emerg+ OCO) | Sec |
|---|---|---|---|---|---|---|---|---|---|
| 37 | 0603289D8Z | Advanced Innovative Analysis and Concepts | 03 | 36,344 | 37,645 | | | 37,645 | U |
| 38 | 0603291D8Z | Advanced Innovative Analysis and Concepts - MHA | 03 | 13,286 | 14,668 | | | 14,668 | U |
| 40 | 0603338D8Z | Defense Modernization and Prototyping | 03 | | | | | | U |
| 42 | 0603342D8Z | Defense Innovation Unit (DIU) | 03 | | 29,398 | | | 29,398 | U |
| 43 | 0603375D8Z | Technology Innovation | 03 | 25,856 | 30,000 | | | 30,000 | U |
| 45 | 0603527D8Z | RETRACT LARCH | 03 | 161,453 | 159,688 | | | 159,688 | U |
| 46 | 0603618D8Z | Joint Electronic Advanced Technology | 03 | 12,680 | 12,063 | | | 12,063 | U |
| 47 | 0603648D8Z | Joint Capability Technology Demonstrations | 03 | 102,494 | 89,859 | | | 89,859 | U |
| 48 | 0603662D8Z | Networked Communications Capabilities | 03 | 12,291 | 2,858 | | | 2,858 | U |
| 49 | 0603680D8Z | Defense-Wide Manufacturing Science and Technology Program | 03 | 171,749 | 197,397 | | | 197,397 | U |
| 51 | 0603699D8Z | Emerging Capabilities Technology Development | 03 | 59,350 | 109,411 | | | 109,411 | U |
| 53 | 0603716D8Z | Strategic Environmental Research Program | 03 | 75,485 | 66,157 | | | 66,157 | U |
| 55 | 0603727D8Z | Joint Warfighting Program | 03 | 5,161 | 4,846 | | | 4,846 | U |
| 60 | 0603769D8Z | Distributed Learning Advanced Technology Development | 03 | 13,414 | 22,446 | | | 22,446 | U |
| 61 | 0603781D8Z | Software Engineering Institute | 03 | 15,016 | 15,111 | | | 15,111 | U |

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FY 2021President's Budget
Exhibit R-1 FY 2021 President's Budget
Total Obligational Authority
(Dollars in Thousands)

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Appropriation: 0400D Research, Development, Test & Eval, DW

| Line No | Program Element Number | Item | Act | FY 2021 Base | FY 2021 OCO for Base Requirements | FY 2021 OCO for Direct War and Enduring Costs | FY 2021 Total OCO | FY 2021 Total (Base + OCO) | Sec |
|---|---|---|---|---|---|---|---|---|---|
| 37 | 0603289D8Z | Advanced Innovative Analysis and Concepts | 03 | 36,524 | | | | 36,524 | U |
| 38 | 0603291D8Z | Advanced Innovative Analysis and Concepts - MHA | 03 | 14,703 | | | | 14,703 | U |
| 40 | 0603338D8Z | Defense Modernization and Prototyping | 03 | 133,375 | | | | 133,375 | U |
| 42 | 0603342D8Z | Defense Innovation Unit (DIU) | 03 | 26,141 | | | | 26,141 | U |
| 43 | 0603375D8Z | Technology Innovation | 03 | 27,709 | | | | 27,709 | U |
| 45 | 0603527D8Z | RETRACT LARCH | 03 | 130,283 | | | | 130,283 | U |
| 46 | 0603618D8Z | Joint Electronic Advanced Technology | 03 | 15,164 | | | | 15,164 | U |
| 47 | 0603648D8Z | Joint Capability Technology Demonstrations | 03 | 85,452 | | | | 85,452 | U |
| 48 | 0603662D8Z | Networked Communications Capabilities | 03 | 5,882 | | | | 5,882 | U |
| 49 | 0603680D8Z | Defense-Wide Manufacturing Science and Technology Program | 03 | 93,817 | | | | 93,817 | U |
| 51 | 0603699D8Z | Emerging Capabilities Technology Development | 03 | | | | | | U |
| 53 | 0603716D8Z | Strategic Environmental Research Program | 03 | 53,862 | | | | 53,862 | U |
| 55 | 0603727D8Z | Joint Warfighting Program | 03 | 3,871 | | | | 3,871 | U |
| 60 | 0603769D8Z | Distributed Learning Advanced Technology Development | 03 | 6,765 | | | | 6,765 | U |
| 61 | 0603781D8Z | Software Engineering Institute | 03 | 12,598 | | | | 12,598 | U |

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FY 2021President's Budget
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(Dollars in Thousands)

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Appropriation: 0400D Research, Development, Test & Eval, DW

| Line No | Program Element Number | Item | Act | FY 2019 (Base + OCO) | FY 2020 Base Enacted | FY 2020 Emergency | FY 2020 OCO Enacted | FY 2020 Total Enacted (Base+Emerg+ OCO) | Sec |
|---|---|---|---|---|---|---|---|---|---|
| 62 | 0603826D8Z | Quick Reaction Special Projects | 03 | 57,004 | 35,647 | | | 35,647 | U |
| 63 | 0603833D8Z | Engineering Science & Technology | 03 | 18,895 | 19,376 | | | 19,376 | U |
| 64 | 0603924D8Z | High Energy Laser Advanced Technology Program | 03 | 71,819 | 80,723 | | | 80,723 | U |
| 65 | 0603941D8Z | Test & Evaluation Science & Technology | 03 | 114,559 | 191,574 | | | 191,574 | U |
| 66 | 0603950D8Z | National Security Innovation Network | 03 | | 40,000 | | | 40,000 | U |
| 67 | 0604055D8Z | Operational Energy Capability Improvement | 03 | 44,362 | 64,900 | | | 64,900 | U |
| 68 | 0303310D8Z | CWMD Systems | 03 | 25,619 | 28,907 | | | 28,907 | U |
| 69 | 0303367D8Z | Spectrum Access Research and Development | 03 | 27,002 | | | | | U |
| | | Advanced Technology Development | | 1,316,889 | 1,437,142 | | 25,230 | 1,462,372 | |
| 72 | 0603161D8Z | Nuclear and Conventional Physical Security Equipment RDT&E ADC&P | 04 | 27,123 | 42,695 | | | 42,695 | U |
| 73 | 0603600D8Z | WALKOFF | 04 | 89,376 | 92,791 | | | 92,791 | U |
| 74 | 0603821D8Z | Acquisition Enterprise Data & Information Services | 04 | 2,500 | 5,659 | | | 5,659 | U |
| 75 | 0603851D8Z | Environmental Security Technical Certification Program | 04 | 41,058 | 68,572 | | | 68,572 | U |
| 91 | 0603920D8Z | Humanitarian Demining | 04 | 10,952 | 14,700 | | | 14,700 | U |
| 92 | 0603923D8Z | Coalition Warfare | 04 | 8,379 | 11,316 | | | 11,316 | U |
| 93 | 0604011D8Z | Next Generation Information Communications Technology (5G) | 04 | 52,000 | 200,000 | | | 200,000 | U |

Defense-Wide
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Exhibit R-1 FY 2021 President's Budget
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(Dollars in Thousands)

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Appropriation: 0400D Research, Development, Test & Eval, DW

| Line No | Program Element Number | Item | Act | FY 2021 Base | FY 2021 OCO for Base Requirements | FY 2021 OCO for Direct War and Enduring Costs | FY 2021 Total OCO | FY 2021 Total (Base + OCO) | Sec |
|---|---|---|---|---|---|---|---|---|---|
| 62 | 0603826D8Z | Quick Reaction Special Projects | 03 | | | | | | U |
| 63 | 0603833D8Z | Engineering Science & Technology | 03 | | | | | | U |
| 64 | 0603924D8Z | High Energy Laser Advanced Technology Program | 03 | 105,410 | | | | 105,410 | U |
| 65 | 0603941D8Z | Test & Evaluation Science & Technology | 03 | 187,065 | | | | 187,065 | U |
| 66 | 0603950D8Z | National Security Innovation Network | 03 | | | | | | U |
| 67 | 0604055D8Z | Operational Energy Capability Improvement | 03 | | | | | | U |
| 68 | 0303310D8Z | CWMD Systems | 03 | | | | | | U |
| 69 | 0303367D8Z | Spectrum Access Research and Development | 03 | | | | | | U |
| | | Advanced Technology Development | | 1,085,375 | | 19,288 | 19,288 | 1,104,663 | |
| 72 | 0603161D8Z | Nuclear and Conventional Physical Security Equipment RDT&E ADC&P | 04 | 32,636 | | | | 32,636 | U |
| 73 | 0603600D8Z | WALKOFF | 04 | 106,529 | | | | 106,529 | U |
| 74 | 0603821D8Z | Acquisition Enterprise Data & Information Services | 04 | | | | | | U |
| 75 | 0603851D8Z | Environmental Security Technical Certification Program | 04 | 61,345 | | | | 61,345 | U |
| 91 | 0603920D8Z | Humanitarian Demining | 04 | | | | | | U |
| 92 | 0603923D8Z | Coalition Warfare | 04 | 10,129 | | | | 10,129 | U |
| 93 | 0604011D8Z | Next Generation Information Communications Technology (5G) | 04 | 449,000 | | | | 449,000 | U |

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(Dollars in Thousands)

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| Line No | Program Element Number | Item | Act | FY 2019 (Base + OCO) | FY 2020 Base Enacted | FY 2020 Emergency | FY 2020 OCO Enacted | FY 2020 Total Enacted (Base+Emerg+ OCO) | Sec |
|---|---|---|---|---|---|---|---|---|---|
| 94 | 0604016D8Z | Department of Defense Corrosion Program | 04 | 9,281 | 13,165 | | | 13,165 | U |
| 96 | 0604132D8Z | Missile Defeat Project | 04 | 41,961 | 14,816 | | | 14,816 | U |
| 99 | 0604250D8Z | Advanced Innovative Technologies | 04 | 1,347,956 | 1,133,365 | | | 1,133,365 | U |
| 100 | 0604294D8Z | Trusted & Assured Microelectronics | 04 | 517,356 | 547,421 | | | 547,421 | U |
| 101 | 0604331D8Z | Rapid Prototyping Program | 04 | 96,196 | 72,351 | | | 72,351 | U |
| 102 | 0604341D8Z | Defense Innovation Unit (DIU) Prototyping | 04 | | 17,000 | | | 17,000 | U |
| 103 | 0604400D8Z | Department of Defense (DoD) Unmanned System Common Development | 04 | 7,625 | 7,021 | | | 7,021 | U |
| 104 | 0604532D8Z | Joint Artificial Intelligence | 04 | 12,968 | | | | | U |
| 107 | 0604682D8Z | Wargaming and Support for Strategic Analysis (SSA) | 04 | 3,621 | 3,751 | | | 3,751 | U |
| 108 | 0604775D8Z | Defense Rapid Innovation Program | 04 | 241,194 | | | | | U |
| 119 | 0303191D8Z | Joint Electromagnetic Technology (JET) Program | 04 | 3,096 | 3,191 | | | 3,191 | U |
| | | Advanced Component Development & Prototypes | | 2,512,642 | 2,247,814 | | | 2,247,814 | |
| 124 | 0604161D8Z | Nuclear and Conventional Physical Security Equipment RDT&E SDD | 05 | 8,185 | 11,276 | | | 11,276 | U |
| 125 | 0604165D8Z | Prompt Global Strike Capability Development | 05 | 525,670 | 151,000 | | | 151,000 | U |
| 127 | 0604771D8Z | Joint Tactical Information Distribution System (JTIDS) | 05 | 46,210 | 54,102 | | | 54,102 | U |
| 131 | 0605022D8Z | Defense Exportability Program | 05 | 1,455 | 12,115 | | | 12,115 | U |

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| Line No | Program Element Number | Item | Act | FY 2021 Base | FY 2021 OCO for Base Requirements | FY 2021 OCO for Direct War and Enduring Costs | FY 2021 Total OCO | FY 2021 Total (Base + OCO) | Sec |
|---|---|---|---|---|---|---|---|---|---|
| 94 | 0604016D8Z | Department of Defense Corrosion Program | 04 | 3,325 | | | | 3,325 | U |
| 96 | 0604132D8Z | Missile Defeat Project | 04 | | | | | | U |
| 99 | 0604250D8Z | Advanced Innovative Technologies | 04 | 730,508 | | | | 730,508 | U |
| 100 | 0604294D8Z | Trusted & Assured Microelectronics | 04 | 489,076 | | | | 489,076 | U |
| 101 | 0604331D8Z | Rapid Prototyping Program | 04 | 102,023 | | | | 102,023 | U |
| 102 | 0604341D8Z | Defense Innovation Unit (DIU) Prototyping | 04 | 13,255 | | | | 13,255 | U |
| 103 | 0604400D8Z | Department of Defense (DoD) Unmanned System Common Development | 04 | 2,787 | | | | 2,787 | U |
| 104 | 0604532D8Z | Joint Artificial Intelligence | 04 | | | | | | U |
| 107 | 0604682D8Z | Wargaming and Support for Strategic Analysis (SSA) | 04 | 3,469 | | | | 3,469 | U |
| 108 | 0604775D8Z | Defense Rapid Innovation Program | 04 | | | | | | U |
| 119 | 0303191D8Z | Joint Electromagnetic Technology (JET) Program | 04 | 997 | | | | 997 | U |
| | | Advanced Component Development & Prototypes | | 2,005,079 | | | | 2,005,079 | |
| 124 | 0604161D8Z | Nuclear and Conventional Physical Security Equipment RDT&E SDD | 05 | 7,173 | | | | 7,173 | U |
| 125 | 0604165D8Z | Prompt Global Strike Capability Development | 05 | | | | | | U |
| 127 | 0604771D8Z | Joint Tactical Information Distribution System (JTIDS) | 05 | 54,985 | | | | 54,985 | U |
| 131 | 0605022D8Z | Defense Exportability Program | 05 | 12,928 | | | | 12,928 | U |

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| Line No | Program Element Number | Item | Act | FY 2019 (Base + OCO) | FY 2020 Base Enacted | FY 2020 Emergency | FY 2020 OCO Enacted | FY 2020 Total Enacted (Base+Emerg+ OCO) | Sec |
|---|---|---|---|---|---|---|---|---|---|
| 132 | 0605027D8Z | OUSD(C) IT Development Initiatives | 05 | 9,219 | 9,590 | | | 9,590 | U |
| 134 | 0605075D8Z | CMO Policy and Integration | 05 | 2,100 | 1,618 | | | 1,618 | U |
| 138 | 0605210D8Z | Defense-Wide Electronic Procurement Capabilities | 05 | 6,126 | 9,619 | | | 9,619 | U |
| 139 | 0605294D8Z | Trusted & Assured Microelectronics | 05 | 94,617 | 175,032 | | | 175,032 | U |
| 140 | 0605772D8Z | Nuclear Command, Control, & Communications | 05 | | | | | | U |
| 143 | 0305304D8Z | DoD Enterprise Energy Information Management (EEIM) | 05 | 2,391 | 4,373 | | | 4,373 | U |
| 144 | 0305310D8Z | CWMD Systems: System Development and Demonstration | 05 | 16,385 | 12,854 | | | 12,854 | U |
| | | System Development & Demonstration | | 712,358 | 441,579 | | | 441,579 | |
| 146 | 0604774D8Z | Defense Readiness Reporting System (DRRS) | 06 | 6,606 | 9,724 | | | 9,724 | U |
| 147 | 0604875D8Z | Joint Systems Architecture Development | 06 | 3,929 | 9,593 | | | 9,593 | U |
| 148 | 0604940D8Z | Central Test and Evaluation Investment Development (CTEIP) | 06 | 295,067 | 390,692 | | | 390,692 | U |
| 149 | 0604942D8Z | Assessments and Evaluations | 06 | 30,138 | 30,834 | | | 30,834 | U |
| 151 | 0605100D8Z | Joint Mission Environment Test Capability (JMETC) | 06 | 88,004 | 89,091 | | | 89,091 | U |
| 152 | 0605104D8Z | Technical Studies, Support and Analysis | 06 | 21,281 | 18,079 | | | 18,079 | U |
| 154 | 0605128D8Z | Classified Program USD(P) | 06 | 127,000 | 104,000 | | | 104,000 | U |
| 155 | 0605142D8Z | Systems Engineering | 06 | 37,446 | 37,140 | | | 37,140 | U |

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|---|---|---|---|---|---|---|---|---|---|
| 132 | 0605027D8Z | OUSD(C) IT Development Initiatives | 05 | 10,259 | | | | 10,259 | U |
| 134 | 0605075D8Z | CMO Policy and Integration | 05 | 1,648 | | | | 1,648 | U |
| 138 | 0605210D8Z | Defense-Wide Electronic Procurement Capabilities | 05 | 8,279 | | | | 8,279 | U |
| 139 | 0605294D8Z | Trusted & Assured Microelectronics | 05 | 107,585 | | | | 107,585 | U |
| 140 | 0605772D8Z | Nuclear Command, Control, & Communications | 05 | 3,685 | | | | 3,685 | U |
| 143 | 0305304D8Z | DoD Enterprise Energy Information Management (EEIM) | 05 | 3,275 | | | | 3,275 | U |
| 144 | 0305310D8Z | CWMD Systems: System Development and Demonstration | 05 | 20,585 | | | | 20,585 | U |
| | | System Development & Demonstration | | 230,402 | | | | 230,402 | |
| 146 | 0604774D8Z | Defense Readiness Reporting System (DRRS) | 06 | 9,793 | | | | 9,793 | U |
| 147 | 0604875D8Z | Joint Systems Architecture Development | 06 | 8,497 | | | | 8,497 | U |
| 148 | 0604940D8Z | Central Test and Evaluation Investment Development (CTEIP) | 06 | 422,451 | | | | 422,451 | U |
| 149 | 0604942D8Z | Assessments and Evaluations | 06 | 18,379 | | | | 18,379 | U |
| 151 | 0605100D8Z | Joint Mission Environment Test Capability (JMETC) | 06 | 79,046 | | | | 79,046 | U |
| 152 | 0605104D8Z | Technical Studies, Support and Analysis | 06 | | | | | | U |
| 154 | 0605128D8Z | Classified Program USD(P) | 06 | | | | | | U |
| 155 | 0605142D8Z | Systems Engineering | 06 | 49,376 | | | | 49,376 | U |

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|---|---|---|---|---|---|---|---|---|---|
| 156 | 0605151D8Z | Studies and Analysis Support - OSD | 06 | 3,423 | 4,759 | | | 4,759 | U |
| 157 | 0605161D8Z | Nuclear Matters-Physical Security | 06 | 4,854 | 8,307 | | | 8,307 | U |
| 158 | 0605170D8Z | Support to Networks and Information Integration | 06 | 11,042 | 9,441 | | | 9,441 | U |
| 159 | 0605200D8Z | General Support to USD (Intelligence) | 06 | 8,139 | 20,200 | | | 20,200 | U |
| 164 | 0605502D8Z | Small Business Innovative Research | 06 | 147,668 | | | | | U |
| 167 | 0605790D8Z | Small Business Innovation Research (SBIR)/ Small Business Technology Transfer | 06 | 2,539 | 3,568 | | | 3,568 | U |
| 168 | 0605797D8Z | Maintaining Technology Advantage | 06 | | 20,936 | | | 20,936 | U |
| 169 | 0605798D8Z | Defense Technology Analysis | 06 | 27,231 | 15,875 | | | 15,875 | U |
| 172 | 0605804D8Z | Development Test and Evaluation | 06 | 19,417 | 22,203 | | | 22,203 | U |
| 175 | 0606100D8Z | Budget and Program Assessments | 06 | 5,544 | 8,017 | | | 8,017 | U |
| 176 | 0606225D8Z | ODNA Technology and Resource Analysis | 06 | 1,028 | 3,194 | | | 3,194 | U |
| 180 | 0203345D8Z | Defense Operations Security Initiative (DOSI) | 06 | 9,892 | 8,037 | | | 8,037 | U |
| 187 | 0303260D8Z | Defense Military Deception Program Office (DMDPO) | 06 | 966 | 1,014 | | | 1,014 | U |
| 191 | 0305245D8Z | Intelligence Capabilities and Innovation Investments | 06 | 188,876 | 15,871 | | | 15,871 | U |
| 192 | 0306310D8Z | CWMD Systems: RDT&E Management Support | 06 | 1,195 | | | | | U |

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|---|---|---|---|---|---|---|---|---|---|
| 156 | 0605151D8Z | Studies and Analysis Support - OSD | 06 | 5,777 | | | | 5,777 | U |
| 157 | 0605161D8Z | Nuclear Matters-Physical Security | 06 | 16,552 | | | | 16,552 | U |
| 158 | 0605170D8Z | Support to Networks and Information Integration | 06 | 9,582 | | | | 9,582 | U |
| 159 | 0605200D8Z | General Support to USD (Intelligence) | 06 | 1,940 | | | | 1,940 | U |
| 164 | 0605502D8Z | Small Business Innovative Research | 06 | | | | | | U |
| 167 | 0605790D8Z | Small Business Innovation Research (SBIR)/ Small Business Technology Transfer | 06 | 3,582 | | | | 3,582 | U |
| 168 | 0605797D8Z | Maintaining Technology Advantage | 06 | 29,566 | | | | 29,566 | U |
| 169 | 0605798D8Z | Defense Technology Analysis | 06 | 29,059 | | | | 29,059 | U |
| 172 | 0605804D8Z | Development Test and Evaluation | 06 | 27,198 | | | | 27,198 | U |
| 175 | 0606100D8Z | Budget and Program Assessments | 06 | 13,173 | | | | 13,173 | U |
| 176 | 0606225D8Z | ODNA Technology and Resource Analysis | 06 | 3,200 | | | | 3,200 | U |
| 180 | 0203345D8Z | Defense Operations Security Initiative (DOSI) | 06 | 3,099 | | | | 3,099 | U |
| 187 | 0303260D8Z | Defense Military Deception Program Office (DMDPO) | 06 | 1,036 | | | | 1,036 | U |
| 191 | 0305245D8Z | Intelligence Capabilities and Innovation Investments | 06 | | | | | | U |
| 192 | 0306310D8Z | CWMD Systems: RDT&E Management Support | 06 | | | | | | U |

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| Line No | Program Element Number | Item | Act | FY 2019 (Base + OCO) | FY 2020 Base Enacted | FY 2020 Emergency | FY 2020 OCO Enacted | FY 2020 Total Enacted (Base+Emerg+ OCO) | Sec |
|---|---|---|---|---|---|---|---|---|---|
| 193 | 0307588D8Z | Algorithmic Warfare Cross Functional Teams | 06 | | 221,235 | | | 221,235 | U |
| 198 | 0909999D8Z | Financing for Cancelled Account Adjustments | 06 | 969 | | | | | U |
| | | Management Support | | 1,042,254 | 1,051,810 | | | 1,051,810 | |
| 203 | 0607210D8Z | Industrial Base Analysis and Sustainment Support | 07 | | 104,051 | | | 104,051 | U |
| 204 | 0607310D8Z | CWMD Systems: Operational Systems Development | 07 | | 12,734 | | | 12,734 | U |
| 216 | 0303140D8Z | Information Systems Security Program | 07 | 17,899 | 67,631 | | | 67,631 | U |
| 235 | 0305186D8Z | Policy R&D Programs | 07 | | 6,301 | | | 6,301 | U |
| 236 | 0305199D8Z | Net Centricity | 07 | 4,071 | 21,384 | | | 21,384 | U |
| 245 | 0305387D8Z | Homeland Defense Technology Transfer Program | 07 | | 2,221 | | | 2,221 | U |
| | | Operational Systems Development | | 21,970 | 214,322 | | | 214,322 | |
| 270 | 0608648D8Z | Acquisition Visibility - Software Pilot Program | 08 | | | | | | U |
| 272 | 0308588D8Z | Algorithmic Warfare Cross Functional Teams - Software Pilot Program | 08 | | | | | | U |
| | | Software And Digital Technology Pilot Progr | | | | | | | |
| Total Research, Development, Test & Eval, DW | | | | 5,984,436 | 5,827,044 | | 25,230 | 5,852,274 | |

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| Line No | Program Element Number | Item | Act | FY 2021 Base | FY 2021 OCO for Base Requirements | FY 2021 OCO for Direct War and Enduring Costs | FY 2021 Total OCO | FY 2021 Total (Base + OCO) | Sec |
|---|---|---|---|---|---|---|---|---|---|
| 193 | 0307588D8Z | Algorithmic Warfare Cross Functional Teams | 06 | | | | | | U |
| 198 | 0909999D8Z | Financing for Cancelled Account Adjustments | 06 | | | | | | U |
| | | Management Support | | 731,306 | | | | 731,306 | |
| 203 | 0607210D8Z | Industrial Base Analysis and Sustainment Support | 07 | 9,151 | | | | 9,151 | U |
| 204 | 0607310D8Z | CWMD Systems: Operational Systems Development | 07 | 19,082 | | | | 19,082 | U |
| 216 | 0303140D8Z | Information Systems Security Program | 07 | 46,577 | | | | 46,577 | U |
| 235 | 0305186D8Z | Policy R&D Programs | 07 | 7,144 | | | | 7,144 | U |
| 236 | 0305199D8Z | Net Centricity | 07 | 21,793 | | | | 21,793 | U |
| 245 | 0305387D8Z | Homeland Defense Technology Transfer Program | 07 | 2,190 | | | | 2,190 | U |
| | | Operational Systems Development | | 105,937 | | | | 105,937 | |
| 270 | 0608648D8Z | Acquisition Visibility - Software Pilot Program | 08 | 16,848 | | | | 16,848 | U |
| 272 | 0308588D8Z | Algorithmic Warfare Cross Functional Teams - Software Pilot Program | 08 | 250,107 | | | | 250,107 | U |
| | | Software And Digital Technology Pilot Progr | | 266,955 | | | | 266,955 | |
| Total Research, Development, Test & Eval, DW | | | | 4,772,874 | | 19,288 | 19,288 | 4,792,162 | |

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|---|---|---|---|---|---|---|---|---|---|
| 3 | 0601110D8Z | Basic Research Initiatives | 01 | 55,195 | 70,874 | | | 70,874 | U |
| 5 | 0601120D8Z | National Defense Education Program | 01 | 132,743 | 144,074 | | | 144,074 | U |
| 6 | 0601228D8Z | Historically Black Colleges and Universities/Minority Institutions | 01 | 38,568 | 52,708 | | | 52,708 | U |
| Basic Research | | | | 226,506 | 267,656 | | | 267,656 | |
| 8 | 0602000D8Z | Joint Munitions Technology | 02 | 19,067 | 19,306 | | | 19,306 | U |
| 11 | 0602230D8Z | Defense Technology Innovation | 02 | | | | | | U |
| 12 | 0602234D8Z | Lincoln Laboratory Research Program | 02 | 49,647 | 52,317 | | | 52,317 | U |
| 13 | 0602251D8Z | Applied Research for the Advancement of S&T Priorities | 02 | 59,567 | 60,400 | | | 60,400 | U |
| 17 | 0602668D8Z | Cyber Security Research | 02 | 14,594 | 25,118 | | | 25,118 | U |
| 22 | 0602751D8Z | Software Engineering Institute (SEI) Applied Research | 02 | 8,942 | 9,580 | | | 9,580 | U |
| Applied Research | | | | 151,817 | 166,721 | | | 166,721 | |
| 24 | 0603000D8Z | Joint Munitions Advanced Technology | 03 | 25,462 | 25,779 | | | 25,779 | U |
| 25 | 0603121D8Z | SO/LIC Advanced Development | 03 | | 5,000 | | | 5,000 | U |
| 26 | 0603122D8Z | Combating Terrorism Technology Support | 03 | 168,012 | 91,517 | | 25,230 | 116,747 | U |
| 27 | 0603133D8Z | Foreign Comparative Testing | 03 | 23,867 | 24,970 | | | 24,970 | U |
| 33 | 0603225D8Z | Joint DoD-DoE Munitions Technology Development | 03 | 17,941 | 18,773 | | | 18,773 | U |
| 36 | 0603288D8Z | Analytic Assessments | 03 | 17,768 | 18,429 | | | 18,429 | U |

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|---|---|---|---|---|---|---|---|---|---|
| 3 | 0601110D8Z | Basic Research Initiatives | 01 | 35,565 | | | | 35,565 | U |
| 5 | 0601120D8Z | National Defense Education Program | 01 | 100,241 | | | | 100,241 | U |
| 6 | 0601228D8Z | Historically Black Colleges and Universities/Minority Institutions | 01 | 30,975 | | | | 30,975 | U |
| Basic Research | | | | 166,781 | | | | 166,781 | |
| 8 | 0602000D8Z | Joint Munitions Technology | 02 | 19,409 | | | | 19,409 | U |
| 11 | 0602230D8Z | Defense Technology Innovation | 02 | 35,000 | | | | 35,000 | U |
| 12 | 0602234D8Z | Lincoln Laboratory Research Program | 02 | 41,080 | | | | 41,080 | U |
| 13 | 0602251D8Z | Applied Research for the Advancement of S&T Priorities | 02 | 60,722 | | | | 60,722 | U |
| 17 | 0602668D8Z | Cyber Security Research | 02 | 15,255 | | | | 15,255 | U |
| 22 | 0602751D8Z | Software Engineering Institute (SEI) Applied Research | 02 | 9,573 | | | | 9,573 | U |
| Applied Research | | | | 181,039 | | | | 181,039 | |
| 24 | 0603000D8Z | Joint Munitions Advanced Technology | 03 | 22,920 | | | | 22,920 | U |
| 25 | 0603121D8Z | SO/LIC Advanced Development | 03 | 4,914 | | | | 4,914 | U |
| 26 | 0603122D8Z | Combating Terrorism Technology Support | 03 | 51,089 | | 19,288 | 19,288 | 70,377 | U |
| 27 | 0603133D8Z | Foreign Comparative Testing | 03 | 25,183 | | | | 25,183 | U |
| 33 | 0603225D8Z | Joint DoD-DoE Munitions Technology Development | 03 | 18,873 | | | | 18,873 | U |
| 36 | 0603288D8Z | Analytic Assessments | 03 | 23,775 | | | | 23,775 | U |

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|---|---|---|---|---|---|---|---|---|---|
| 37 | 0603289D8Z | Advanced Innovative Analysis and Concepts | 03 | 36,344 | 37,645 | | | 37,645 | U |
| 38 | 0603291D8Z | Advanced Innovative Analysis and Concepts - MHA | 03 | 13,286 | 14,668 | | | 14,668 | U |
| 40 | 0603338D8Z | Defense Modernization and Prototyping | 03 | | | | | | U |
| 42 | 0603342D8Z | Defense Innovation Unit (DIU) | 03 | | 29,398 | | | 29,398 | U |
| 43 | 0603375D8Z | Technology Innovation | 03 | 25,856 | 30,000 | | | 30,000 | U |
| 45 | 0603527D8Z | RETRACT LARCH | 03 | 161,453 | 159,688 | | | 159,688 | U |
| 46 | 0603618D8Z | Joint Electronic Advanced Technology | 03 | 12,680 | 12,063 | | | 12,063 | U |
| 47 | 0603648D8Z | Joint Capability Technology Demonstrations | 03 | 102,494 | 89,859 | | | 89,859 | U |
| 48 | 0603662D8Z | Networked Communications Capabilities | 03 | 12,291 | 2,858 | | | 2,858 | U |
| 49 | 0603680D8Z | Defense-Wide Manufacturing Science and Technology Program | 03 | 171,749 | 197,397 | | | 197,397 | U |
| 51 | 0603699D8Z | Emerging Capabilities Technology Development | 03 | 59,350 | 109,411 | | | 109,411 | U |
| 53 | 0603716D8Z | Strategic Environmental Research Program | 03 | 75,485 | 66,157 | | | 66,157 | U |
| 55 | 0603727D8Z | Joint Warfighting Program | 03 | 5,161 | 4,846 | | | 4,846 | U |
| 60 | 0603769D8Z | Distributed Learning Advanced Technology Development | 03 | 13,414 | 22,446 | | | 22,446 | U |
| 61 | 0603781D8Z | Software Engineering Institute | 03 | 15,016 | 15,111 | | | 15,111 | U |

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|---|---|---|---|---|---|---|---|---|---|
| 37 | 0603289D8Z | Advanced Innovative Analysis and Concepts | 03 | 36,524 | | | | 36,524 | U |
| 38 | 0603291D8Z | Advanced Innovative Analysis and Concepts - MHA | 03 | 14,703 | | | | 14,703 | U |
| 40 | 0603338D8Z | Defense Modernization and Prototyping | 03 | 133,375 | | | | 133,375 | U |
| 42 | 0603342D8Z | Defense Innovation Unit (DIU) | 03 | 26,141 | | | | 26,141 | U |
| 43 | 0603375D8Z | Technology Innovation | 03 | 27,709 | | | | 27,709 | U |
| 45 | 0603527D8Z | RETRACT LARCH | 03 | 130,283 | | | | 130,283 | U |
| 46 | 0603618D8Z | Joint Electronic Advanced Technology | 03 | 15,164 | | | | 15,164 | U |
| 47 | 0603648D8Z | Joint Capability Technology Demonstrations | 03 | 85,452 | | | | 85,452 | U |
| 48 | 0603662D8Z | Networked Communications Capabilities | 03 | 5,882 | | | | 5,882 | U |
| 49 | 0603680D8Z | Defense-Wide Manufacturing Science and Technology Program | 03 | 93,817 | | | | 93,817 | U |
| 51 | 0603699D8Z | Emerging Capabilities Technology Development | 03 | | | | | | U |
| 53 | 0603716D8Z | Strategic Environmental Research Program | 03 | 53,862 | | | | 53,862 | U |
| 55 | 0603727D8Z | Joint Warfighting Program | 03 | 3,871 | | | | 3,871 | U |
| 60 | 0603769D8Z | Distributed Learning Advanced Technology Development | 03 | 6,765 | | | | 6,765 | U |
| 61 | 0603781D8Z | Software Engineering Institute | 03 | 12,598 | | | | 12,598 | U |

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|---|---|---|---|---|---|---|---|---|---|
| 62 | 0603826D8Z | Quick Reaction Special Projects | 03 | 57,004 | 35,647 | | | 35,647 | U |
| 63 | 0603833D8Z | Engineering Science & Technology | 03 | 18,895 | 19,376 | | | 19,376 | U |
| 64 | 0603924D8Z | High Energy Laser Advanced Technology Program | 03 | 71,819 | 80,723 | | | 80,723 | U |
| 65 | 0603941D8Z | Test & Evaluation Science & Technology | 03 | 114,559 | 191,574 | | | 191,574 | U |
| 66 | 0603950D8Z | National Security Innovation Network | 03 | | 40,000 | | | 40,000 | U |
| 67 | 0604055D8Z | Operational Energy Capability Improvement | 03 | 44,362 | 64,900 | | | 64,900 | U |
| 68 | 0303310D8Z | CWMD Systems | 03 | 25,619 | 28,907 | | | 28,907 | U |
| 69 | 0303367D8Z | Spectrum Access Research and Development | 03 | 27,002 | | | | | U |
| | | Advanced Technology Development | | 1,316,889 | 1,437,142 | | 25,230 | 1,462,372 | |
| 72 | 0603161D8Z | Nuclear and Conventional Physical Security Equipment RDT&E ADC&P | 04 | 27,123 | 42,695 | | | 42,695 | U |
| 73 | 0603600D8Z | WALKOFF | 04 | 89,376 | 92,791 | | | 92,791 | U |
| 74 | 0603821D8Z | Acquisition Enterprise Data & Information Services | 04 | 2,500 | 5,659 | | | 5,659 | U |
| 75 | 0603851D8Z | Environmental Security Technical Certification Program | 04 | 41,058 | 68,572 | | | 68,572 | U |
| 91 | 0603920D8Z | Humanitarian Demining | 04 | 10,952 | 14,700 | | | 14,700 | U |
| 92 | 0603923D8Z | Coalition Warfare | 04 | 8,379 | 11,316 | | | 11,316 | U |
| 93 | 0604011D8Z | Next Generation Information Communications Technology (5G) | 04 | 52,000 | 200,000 | | | 200,000 | U |

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Appropriation: 0400D Research, Development, Test & Eval, DW

| Line No | Program Element Number | Item | Act | FY 2021 Base | FY 2021 OCO for Base Requirements | FY 2021 OCO for Direct War and Enduring Costs | FY 2021 Total OCO | FY 2021 Total (Base + OCO) | Sec |
|---|---|---|---|---|---|---|---|---|---|
| 62 | 0603826D8Z | Quick Reaction Special Projects | 03 | | | | | | U |
| 63 | 0603833D8Z | Engineering Science & Technology | 03 | | | | | | U |
| 64 | 0603924D8Z | High Energy Laser Advanced Technology Program | 03 | 105,410 | | | | 105,410 | U |
| 65 | 0603941D8Z | Test & Evaluation Science & Technology | 03 | 187,065 | | | | 187,065 | U |
| 66 | 0603950D8Z | National Security Innovation Network | 03 | | | | | | U |
| 67 | 0604055D8Z | Operational Energy Capability Improvement | 03 | | | | | | U |
| 68 | 0303310D8Z | CWMD Systems | 03 | | | | | | U |
| 69 | 0303367D8Z | Spectrum Access Research and Development | 03 | | | | | | U |
| | | Advanced Technology Development | | 1,085,375 | | 19,288 | 19,288 | 1,104,663 | |
| 72 | 0603161D8Z | Nuclear and Conventional Physical Security Equipment RDT&E ADC&P | 04 | 32,636 | | | | 32,636 | U |
| 73 | 0603600D8Z | WALKOFF | 04 | 106,529 | | | | 106,529 | U |
| 74 | 0603821D8Z | Acquisition Enterprise Data & Information Services | 04 | | | | | | U |
| 75 | 0603851D8Z | Environmental Security Technical Certification Program | 04 | 61,345 | | | | 61,345 | U |
| 91 | 0603920D8Z | Humanitarian Demining | 04 | | | | | | U |
| 92 | 0603923D8Z | Coalition Warfare | 04 | 10,129 | | | | 10,129 | U |
| 93 | 0604011D8Z | Next Generation Information Communications Technology (5G) | 04 | 449,000 | | | | 449,000 | U |

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| Line No | Program Element Number | Item | Act | FY 2019 (Base + OCO) | FY 2020 Base Enacted | FY 2020 Emergency | FY 2020 OCO Enacted | FY 2020 Total Enacted (Base+Emerg+ OCO) | Sec |
|---|---|---|---|---|---|---|---|---|---|
| 94 | 0604016D8Z | Department of Defense Corrosion Program | 04 | 9,281 | 13,165 | | | 13,165 | U |
| 96 | 0604132D8Z | Missile Defeat Project | 04 | 41,961 | 14,816 | | | 14,816 | U |
| 99 | 0604250D8Z | Advanced Innovative Technologies | 04 | 1,347,956 | 1,133,365 | | | 1,133,365 | U |
| 100 | 0604294D8Z | Trusted & Assured Microelectronics | 04 | 517,356 | 547,421 | | | 547,421 | U |
| 101 | 0604331D8Z | Rapid Prototyping Program | 04 | 96,196 | 72,351 | | | 72,351 | U |
| 102 | 0604341D8Z | Defense Innovation Unit (DIU) Prototyping | 04 | | 17,000 | | | 17,000 | U |
| 103 | 0604400D8Z | Department of Defense (DoD) Unmanned System Common Development | 04 | 7,625 | 7,021 | | | 7,021 | U |
| 104 | 0604532D8Z | Joint Artificial Intelligence | 04 | 12,968 | | | | | U |
| 107 | 0604682D8Z | Wargaming and Support for Strategic Analysis (SSA) | 04 | 3,621 | 3,751 | | | 3,751 | U |
| 108 | 0604775D8Z | Defense Rapid Innovation Program | 04 | 241,194 | | | | | U |
| 119 | 0303191D8Z | Joint Electromagnetic Technology (JET) Program | 04 | 3,096 | 3,191 | | | 3,191 | U |
| | | Advanced Component Development & Prototypes | | 2,512,642 | 2,247,814 | | | 2,247,814 | |
| 124 | 0604161D8Z | Nuclear and Conventional Physical Security Equipment RDT&E SDD | 05 | 8,185 | 11,276 | | | 11,276 | U |
| 125 | 0604165D8Z | Prompt Global Strike Capability Development | 05 | 525,670 | 151,000 | | | 151,000 | U |
| 127 | 0604771D8Z | Joint Tactical Information Distribution System (JTIDS) | 05 | 46,210 | 54,102 | | | 54,102 | U |
| 131 | 0605022D8Z | Defense Exportability Program | 05 | 1,455 | 12,115 | | | 12,115 | U |

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Appropriation: 0400D Research, Development, Test & Eval, DW

| Line No | Program Element Number | Item | Act | FY 2021 Base | FY 2021 OCO for Base Requirements | FY 2021 OCO for Direct War and Enduring Costs | FY 2021 Total OCO | FY 2021 Total (Base + OCO) | Sec |
|---|---|---|---|---|---|---|---|---|---|
| 94 | 0604016D8Z | Department of Defense Corrosion Program | 04 | 3,325 | | | | 3,325 | U |
| 96 | 0604132D8Z | Missile Defeat Project | 04 | | | | | | U |
| 99 | 0604250D8Z | Advanced Innovative Technologies | 04 | 730,508 | | | | 730,508 | U |
| 100 | 0604294D8Z | Trusted & Assured Microelectronics | 04 | 489,076 | | | | 489,076 | U |
| 101 | 0604331D8Z | Rapid Prototyping Program | 04 | 102,023 | | | | 102,023 | U |
| 102 | 0604341D8Z | Defense Innovation Unit (DIU) Prototyping | 04 | 13,255 | | | | 13,255 | U |
| 103 | 0604400D8Z | Department of Defense (DoD) Unmanned System Common Development | 04 | 2,787 | | | | 2,787 | U |
| 104 | 0604532D8Z | Joint Artificial Intelligence | 04 | | | | | | U |
| 107 | 0604682D8Z | Wargaming and Support for Strategic Analysis (SSA) | 04 | 3,469 | | | | 3,469 | U |
| 108 | 0604775D8Z | Defense Rapid Innovation Program | 04 | | | | | | U |
| 119 | 0303191D8Z | Joint Electromagnetic Technology (JET) Program | 04 | 997 | | | | 997 | U |
| | | Advanced Component Development & Prototypes | | 2,005,079 | | | | 2,005,079 | |
| 124 | 0604161D8Z | Nuclear and Conventional Physical Security Equipment RDT&E SDD | 05 | 7,173 | | | | 7,173 | U |
| 125 | 0604165D8Z | Prompt Global Strike Capability Development | 05 | | | | | | U |
| 127 | 0604771D8Z | Joint Tactical Information Distribution System (JTIDS) | 05 | 54,985 | | | | 54,985 | U |
| 131 | 0605022D8Z | Defense Exportability Program | 05 | 12,928 | | | | 12,928 | U |

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| Line No | Program Element Number | Item | Act | FY 2019 (Base + OCO) | FY 2020 Base Enacted | FY 2020 Emergency | FY 2020 OCO Enacted | FY 2020 Total Enacted (Base+Emerg+ OCO) | Sec |
|---|---|---|---|---|---|---|---|---|---|
| 132 | 0605027D8Z | OUSD(C) IT Development Initiatives | 05 | 9,219 | 9,590 | | | 9,590 | U |
| 134 | 0605075D8Z | CMO Policy and Integration | 05 | 2,100 | 1,618 | | | 1,618 | U |
| 138 | 0605210D8Z | Defense-Wide Electronic Procurement Capabilities | 05 | 6,126 | 9,619 | | | 9,619 | U |
| 139 | 0605294D8Z | Trusted & Assured Microelectronics | 05 | 94,617 | 175,032 | | | 175,032 | U |
| 140 | 0605772D8Z | Nuclear Command, Control, & Communications | 05 | | | | | | U |
| 143 | 0305304D8Z | DoD Enterprise Energy Information Management (EEIM) | 05 | 2,391 | 4,373 | | | 4,373 | U |
| 144 | 0305310D8Z | CWMD Systems: System Development and Demonstration | 05 | 16,385 | 12,854 | | | 12,854 | U |
| | | System Development & Demonstration | | 712,358 | 441,579 | | | 441,579 | |
| 146 | 0604774D8Z | Defense Readiness Reporting System (DRRS) | 06 | 6,606 | 9,724 | | | 9,724 | U |
| 147 | 0604875D8Z | Joint Systems Architecture Development | 06 | 3,929 | 9,593 | | | 9,593 | U |
| 148 | 0604940D8Z | Central Test and Evaluation Investment Development (CTEIP) | 06 | 295,067 | 390,692 | | | 390,692 | U |
| 149 | 0604942D8Z | Assessments and Evaluations | 06 | 30,138 | 30,834 | | | 30,834 | U |
| 151 | 0605100D8Z | Joint Mission Environment Test Capability (JMETC) | 06 | 88,004 | 89,091 | | | 89,091 | U |
| 152 | 0605104D8Z | Technical Studies, Support and Analysis | 06 | 21,281 | 18,079 | | | 18,079 | U |
| 154 | 0605128D8Z | Classified Program USD(P) | 06 | 127,000 | 104,000 | | | 104,000 | U |
| 155 | 0605142D8Z | Systems Engineering | 06 | 37,446 | 37,140 | | | 37,140 | U |

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| Line No | Program Element Number | Item | Act | FY 2021 Base | FY 2021 OCO for Base Requirements | FY 2021 OCO for Direct War and Enduring Costs | FY 2021 Total OCO | FY 2021 Total (Base + OCO) | Sec |
|---|---|---|---|---|---|---|---|---|---|
| 132 | 0605027D8Z | OUSD(C) IT Development Initiatives | 05 | 10,259 | | | | 10,259 | U |
| 134 | 0605075D8Z | CMO Policy and Integration | 05 | 1,648 | | | | 1,648 | U |
| 138 | 0605210D8Z | Defense-Wide Electronic Procurement Capabilities | 05 | 8,279 | | | | 8,279 | U |
| 139 | 0605294D8Z | Trusted & Assured Microelectronics | 05 | 107,585 | | | | 107,585 | U |
| 140 | 0605772D8Z | Nuclear Command, Control, & Communications | 05 | 3,685 | | | | 3,685 | U |
| 143 | 0305304D8Z | DoD Enterprise Energy Information Management (EEIM) | 05 | 3,275 | | | | 3,275 | U |
| 144 | 0305310D8Z | CWMD Systems: System Development and Demonstration | 05 | 20,585 | | | | 20,585 | U |
| | System Development & Demonstration | | | 230,402 | | | | 230,402 | |
| 146 | 0604774D8Z | Defense Readiness Reporting System (DRRS) | 06 | 9,793 | | | | 9,793 | U |
| 147 | 0604875D8Z | Joint Systems Architecture Development | 06 | 8,497 | | | | 8,497 | U |
| 148 | 0604940D8Z | Central Test and Evaluation Investment Development (CTEIP) | 06 | 422,451 | | | | 422,451 | U |
| 149 | 0604942D8Z | Assessments and Evaluations | 06 | 18,379 | | | | 18,379 | U |
| 151 | 0605100D8Z | Joint Mission Environment Test Capability (JMETC) | 06 | 79,046 | | | | 79,046 | U |
| 152 | 0605104D8Z | Technical Studies, Support and Analysis | 06 | | | | | | U |
| 154 | 0605128D8Z | Classified Program USD(P) | 06 | | | | | | U |
| 155 | 0605142D8Z | Systems Engineering | 06 | 49,376 | | | | 49,376 | U |

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| Line No | Program Element Number | Item | Act | FY 2019 (Base + OCO) | FY 2020 Base Enacted | FY 2020 Emergency | FY 2020 OCO Enacted | FY 2020 Total Enacted (Base+Emerg+ OCO) | Sec |
|---|---|---|---|---|---|---|---|---|---|
| 156 | 0605151D8Z | Studies and Analysis Support - OSD | 06 | 3,423 | 4,759 | | | 4,759 | U |
| 157 | 0605161D8Z | Nuclear Matters-Physical Security | 06 | 4,854 | 8,307 | | | 8,307 | U |
| 158 | 0605170D8Z | Support to Networks and Information Integration | 06 | 11,042 | 9,441 | | | 9,441 | U |
| 159 | 0605200D8Z | General Support to USD (Intelligence) | 06 | 8,139 | 20,200 | | | 20,200 | U |
| 164 | 0605502D8Z | Small Business Innovative Research | 06 | 147,668 | | | | | U |
| 167 | 0605790D8Z | Small Business Innovation Research (SBIR)/ Small Business Technology Transfer | 06 | 2,539 | 3,568 | | | 3,568 | U |
| 168 | 0605797D8Z | Maintaining Technology Advantage | 06 | | 20,936 | | | 20,936 | U |
| 169 | 0605798D8Z | Defense Technology Analysis | 06 | 27,231 | 15,875 | | | 15,875 | U |
| 172 | 0605804D8Z | Development Test and Evaluation | 06 | 19,417 | 22,203 | | | 22,203 | U |
| 175 | 0606100D8Z | Budget and Program Assessments | 06 | 5,544 | 8,017 | | | 8,017 | U |
| 176 | 0606225D8Z | ODNA Technology and Resource Analysis | 06 | 1,028 | 3,194 | | | 3,194 | U |
| 180 | 0203345D8Z | Defense Operations Security Initiative (DOSI) | 06 | 9,892 | 8,037 | | | 8,037 | U |
| 187 | 0303260D8Z | Defense Military Deception Program Office (DMDPO) | 06 | 966 | 1,014 | | | 1,014 | U |
| 191 | 0305245D8Z | Intelligence Capabilities and Innovation Investments | 06 | 188,876 | 15,871 | | | 15,871 | U |
| 192 | 0306310D8Z | CWMD Systems: RDT&E Management Support | 06 | 1,195 | | | | | U |

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| Line No | Program Element Number | Item | Act | FY 2021 Base | FY 2021 OCO for Base Requirements | FY 2021 OCO for Direct War and Enduring Costs | FY 2021 Total OCO | FY 2021 Total (Base + OCO) | Sec |
|---|---|---|---|---|---|---|---|---|---|
| 156 | 0605151D8Z | Studies and Analysis Support - OSD | 06 | 5,777 | | | | 5,777 | U |
| 157 | 0605161D8Z | Nuclear Matters-Physical Security | 06 | 16,552 | | | | 16,552 | U |
| 158 | 0605170D8Z | Support to Networks and Information Integration | 06 | 9,582 | | | | 9,582 | U |
| 159 | 0605200D8Z | General Support to USD (Intelligence) | 06 | 1,940 | | | | 1,940 | U |
| 164 | 0605502D8Z | Small Business Innovative Research | 06 | | | | | | U |
| 167 | 0605790D8Z | Small Business Innovation Research (SBIR)/ Small Business Technology Transfer | 06 | 3,582 | | | | 3,582 | U |
| 168 | 0605797D8Z | Maintaining Technology Advantage | 06 | 29,566 | | | | 29,566 | U |
| 169 | 0605798D8Z | Defense Technology Analysis | 06 | 29,059 | | | | 29,059 | U |
| 172 | 0605804D8Z | Development Test and Evaluation | 06 | 27,198 | | | | 27,198 | U |
| 175 | 0606100D8Z | Budget and Program Assessments | 06 | 13,173 | | | | 13,173 | U |
| 176 | 0606225D8Z | ODNA Technology and Resource Analysis | 06 | 3,200 | | | | 3,200 | U |
| 180 | 0203345D8Z | Defense Operations Security Initiative (DOSI) | 06 | 3,099 | | | | 3,099 | U |
| 187 | 0303260D8Z | Defense Military Deception Program Office (DMDPO) | 06 | 1,036 | | | | 1,036 | U |
| 191 | 0305245D8Z | Intelligence Capabilities and Innovation Investments | 06 | | | | | | U |
| 192 | 0306310D8Z | CWMD Systems: RDT&E Management Support | 06 | | | | | | U |

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| Line No | Program Element Number | Item | Act | FY 2019 (Base + OCO) | FY 2020 Base Enacted | FY 2020 Emergency | FY 2020 OCO Enacted | FY 2020 Total Enacted (Base+Emerg+ OCO) | Sec |
|---|---|---|---|---|---|---|---|---|---|
| 193 | 0307588D8Z | Algorithmic Warfare Cross Functional Teams | 06 | | 221,235 | | | 221,235 | U |
| 198 | 0909999D8Z | Financing for Cancelled Account Adjustments | 06 | 969 | | | | | U |
| Management Support | | | | 1,042,254 | 1,051,810 | | | 1,051,810 | |
| 203 | 0607210D8Z | Industrial Base Analysis and Sustainment Support | 07 | | 104,051 | | | 104,051 | U |
| 204 | 0607310D8Z | CWMD Systems: Operational Systems Development | 07 | | 12,734 | | | 12,734 | U |
| 216 | 0303140D8Z | Information Systems Security Program | 07 | 17,899 | 67,631 | | | 67,631 | U |
| 235 | 0305186D8Z | Policy R&D Programs | 07 | | 6,301 | | | 6,301 | U |
| 236 | 0305199D8Z | Net Centricity | 07 | 4,071 | 21,384 | | | 21,384 | U |
| 245 | 0305387D8Z | Homeland Defense Technology Transfer Program | 07 | | 2,221 | | | 2,221 | U |
| Operational Systems Development | | | | 21,970 | 214,322 | | | 214,322 | |
| 270 | 0608648D8Z | Acquisition Visibility - Software Pilot Program | 08 | | | | | | U |
| 272 | 0308588D8Z | Algorithmic Warfare Cross Functional Teams - Software Pilot Program | 08 | | | | | | U |
| Software And Digital Technology Pilot Programs | | | | | | | | | |
| Total Office of Secretary of Defense | | | | 5,984,436 | 5,827,044 | | 25,230 | 5,852,274 | |

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| Line No | Program Element Number | Item | Act | FY 2021 Base | FY 2021 OCO for Base Requirements | FY 2021 OCO for Direct War and Enduring Costs | FY 2021 Total OCO | FY 2021 Total (Base + OCO) | Sec |
|---|---|---|---|---|---|---|---|---|---|
| 193 | 0307588D8Z | Algorithmic Warfare Cross Functional Teams | 06 | | | | | | U |
| 198 | 0909999D8Z | Financing for Cancelled Account Adjustments | 06 | | | | | | U |
| | Management Support | | | 731,306 | | | | 731,306 | |
| 203 | 0607210D8Z | Industrial Base Analysis and Sustainment Support | 07 | 9,151 | | | | 9,151 | U |
| 204 | 0607310D8Z | CWMD Systems: Operational Systems Development | 07 | 19,082 | | | | 19,082 | U |
| 216 | 0303140D8Z | Information Systems Security Program | 07 | 46,577 | | | | 46,577 | U |
| 235 | 0305186D8Z | Policy R&D Programs | 07 | 7,144 | | | | 7,144 | U |
| 236 | 0305199D8Z | Net Centricity | 07 | 21,793 | | | | 21,793 | U |
| 245 | 0305387D8Z | Homeland Defense Technology Transfer Program | 07 | 2,190 | | | | 2,190 | U |
| | Operational Systems Development | | | 105,937 | | | | 105,937 | |
| 270 | 0608648D8Z | Acquisition Visibility - Software Pilot Program | 08 | 16,848 | | | | 16,848 | U |
| 272 | 0308588D8Z | Algorithmic Warfare Cross Functional Teams - Software Pilot Program | 08 | 250,107 | | | | 250,107 | U |
| | Software And Digital Technology Pilot Programs | | | 266,955 | | | | 266,955 | |
| Total Office of Secretary of Defense | | | | 4,772,874 | | 19,288 | 19,288 | 4,792,162 | |

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***Appropriation 0400: Research, Development, Test & Evaluation, Defense-Wide***

***Appropriation 0400: Research, Development, Test & Evaluation, Defense-Wide***

***Appropriation 0400: Research, Development, Test & Evaluation, Defense-Wide***

***Appropriation 0400: Research, Development, Test & Evaluation, Defense-Wide***



***Appropriation 0400: Research, Development, Test & Evaluation, Defense-Wide***

***Appropriation 0400: Research, Development, Test & Evaluation, Defense-Wide***

***Appropriation 0400: Research, Development, Test & Evaluation, Defense-Wide***



***Appropriation 0400: Research, Development, Test & Evaluation, Defense-Wide***

***Appropriation 0400: Research, Development, Test & Evaluation, Defense-Wide***



***Appropriation 0400: Research, Development, Test & Evaluation, Defense-Wide***

## Program Element Table of Contents (Alphabetically by Program Element Title)

## Listing of Acronyms

| ACRONYM | DEFINITION |
|---|---|
| AI | Artificial Intelligence |
| ARDEC | Army Armament Research, Development, and Engineering Center |
| AMRDEC | Aviation and Missile Research, Development, and Engineering Center |
| AT&L | Acquisition Technology and Logistics |
| C2 | Command and Control |
| C3 | Command, Controls, and Communications |
| C4 | Command, Controls, Communications, and Computer |
| C4I | Command, Controls, Communications, Computer, and Intelligence |
| C4ISR | Command, Controls, Communications, Computer, Intelligence, Surveillance and Reconnaissance |
| C4IAS | Command, Controls, Communications, Computer, and Intelligence Automation System |
| CBRNE | Chemical, Biological, Radiological, Nuclear, and high-yield Explosives |
| CIED | Counter-Improvised Explosive Device |
| CND | Computer Network Defense |
| COCOMs | Combatant Commands |
| CTTSO | Combating Terrorism Technical Support Office |
| CWMD | Countering Weapons of Mass Destruction |
| DARPA | Defense Advanced Research Projects Agency |
| DIU | Defense Innovation Unit |
| DIUx | Defense Innovation Unit Experimental |
| DOD | Department of Defense |
| DPPG | Defense Policy and Planning Guidance |
| DTRA | Defense Threat Reduction Agency |
| DT&E | Development, Test and Evaluation |
| EDTC | Engineering and Development Test Center |
| EOD | Explosive Ordnance Disposal |
| ESTCP | Environmental Security Technology Certification Program |
| FATGS | Fuze Area Technology Groups |
| FCT | Foreign Comparative Testing |
| FFRDC | FFRDC Federally Funded Research and Development Center |
| GCC | Global Command and Control |
| HBCU/MI | Historically Black Colleges and Universities and Minority Institutions |
| IED | Improvised Explosive Device |
| IM | Insensitive Munitions |
| IMD | Intelligence Mission Data |

## Listing of Acronyms

| | |
|---|---|
| IOC | Initial Operational Capability |
| IoT | Internet of Things |
| ISR | Intelligence, Surveillance, Reconnaissance |
| ISSP | Information Systems Security Program |
| IWS | Irregular Warfare Support |
| JAIC | Joint Artificial Intelligence Center |
| JCIDS | Joint Capabilities Integration and Development System |
| JCTD | Joint Concept Technology Demonstration |
| JFTP | Joint Fuze Technology Program |
| JIEDDO | Joint Improvised Explosive Device Defeat Organization |
| JIMTP | Joint Insensitive Munitions Technology Program |
| JRAC | Joint Rapid Acquisition Cell |
| JUON/JEON | Joint Urgent Operational Needs / Joint Emergent Operational Needs |
| LiDaR | Light Detection and Ranging |
| LUCI | Laboratory University Collaboration Initiative |
| M&S | Modeling and Simulation |
| MATGs | Munition Area Technology Groups |
| MDDE | Missile Defeat Defense Enhancement |
| MEMS | MEMS - MicroElectro-Mechanical Systems (MEMS) |
| MCPP | Military Child Pilot Program |
| NDAA | National Defense Authorization Act |
| NDEP | National Defense Education Program |
| NDS | National Defense Strategy |
| NSSEFF | National Security Science and Engineering Faculty Fellowship |
| NWC | Nuclear Weapons Council |
| OCO | Overseas Contingency Operations |
| OCONUS | Outside the Continental United States |
| OLED | Organic Light Emitting Diode |
| OSD | Office of the Secretary of Defense |
| OSTP | Office of Science and Technology Policy |
| PEO | Program Executive Officers |
| QDR | Quadrennial Defense Review |
| RDT&E | Research Development Test and Evaluation |
| RHBD | Radiation Hardened by Design |
| RHM | Radiation Hardened Microelectronics |
| ROI | Return on Investments |
| S&E | Scientists and Engineers |

## Listing of Acronyms

| | |
|---|---|
| S&T | Science & Technology |
| SBIR | Small Business Innovative Research |
| SCO | Strategic Capabilities Office |
| SMART | Science, Mathematics, and Research for Transformation |
| SOF | Special Operations Forces |
| SSBR | Strategic Support for Basic Research |
| STEM | Science, Technology, Engineering, and Mathematics |
| STTR | Small Business Technology Transfer |
| THAAD | Terminal High Altitude Area Defense |
| TOA | Total Obligation Authority |
| TRL | Technology Readiness Level |
| UAS | Unmanned Aerial Systems |
| USD/A&S | Under Secretary of Defense for Acquisition and Sustainment |
| USD/R&E | Under Secretary of Defense for Research and Engineering |
| USG | USG United States Government |
| USNORTHCOM | U.S. Northern Command |
| USPACOM | U.S. Pacific Command |
| USSOCOM | U.S. Special Operations Command |
| USSTRATCOM | U.S. Strategic Command |
| UXO | Unexploded Ordnance |
| WMD | Weapons of Mass Destruction |
| WSMR | White Sands Missile Range |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 1: *Basic Research* | **R-1 Program Element (Number/Name)**<br>PE 0601110D8Z / *Basic Research Initiatives* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 39.051 | 55.195 | 70.874 | 35.565 | - | 35.565 | 36.382 | 36.988 | 38.007 | 38.794 | Continuing | Continuing |
| 010: *Basic Research Initiatives* | 11.960 | 26.195 | 36.577 | 3.966 | - | 3.966 | 4.110 | 4.155 | 4.328 | 4.430 | Continuing | Continuing |
| 060: *Vannevar Bush Faculty Fellowship* | 27.091 | 29.000 | 34.297 | 31.599 | - | 31.599 | 32.272 | 32.833 | 33.679 | 34.364 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

Basic research provides the Department of Defense (DoD) with a deep and broad awareness of current directions in areas of research important to U.S. military capabilities – including physics and the physical sciences, materials science, chemistry and chemical engineering, electrical engineering, mathematics, computer science, mechanical and aerodynamic engineering, ocean sciences, biological sciences, and the social sciences, among others. Basic research sustains scientific and engineering communities as it generates the critical technical knowledge underpinnings of DoD capabilities. Basic research allows exploration and discovery, yielding disruptive non-incremental advances that can improve or radically change military capabilities, strategy, and operations.

The Basic Research Initiatives program element (PE) supports the defense basic research enterprise in three critical areas: Strategic Support for Basic Research (SSBR), the Minerva Research Initiative (MRI), and the Vannevar Bush Faculty Fellowship Program (VBFF).

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 56.573 | 48.874 | 45.935 | - | 45.935 |
| Current President's Budget | 55.195 | 70.874 | 35.565 | - | 35.565 |
| Total Adjustments | -1.378 | 22.000 | -10.370 | - | -10.370 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | 22.000 | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | -1.368 | - | | | |
| • Other Adjustments | -0.010 | - | -0.375 | - | -0.375 |
| • Economic Assumption | - | - | -0.048 | - | -0.048 |
| • Re-alignment from PE 0601120D8Z | - | - | 3.000 | - | 3.000 |
| • Reduction for Defense Wide Review | - | - | -12.947 | - | -12.947 |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
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| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 1: *Basic Research* | **R-1 Program Element (Number/Name)**<br>PE 0601110D8Z / *Basic Research Initiatives* |

| Congressional Add Details ($ in Millions, and Includes General Reductions) | FY 2019 | FY 2020 |
|---|---|---|
| **Project:** 010: *Basic Research Initiatives* | | |
| Congressional Add: *Program Increase for Minerva Research Initiative* | 1.960 | 2.000 |
| Congressional Add: *Defense Experimental Program to Stimulate Competitive Research (DEPSCOR)* | 12.000 | 12.000 |
| Congressional Add: *Cyber* | - | 8.000 |
| Congressional Add Subtotals for Project: 010 | 13.960 | 22.000 |
| Congressional Add Totals for all Projects | 13.960 | 22.000 |

**Change Summary Explanation**

FY 2021 internal program adjustments will support the Laboratory University Collaboration Initiative (LUCI) executed under Project 010. Internal program adjustments are consistent with higher priority DoD requirements.

Defense-Wide Review: The FY 2021 funding request was reduced by $12.947 million during DWR to account for the end of the Minerva Research Initiative in FY 2021.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 1 | R-1 Program Element (Number/Name)<br>PE 0601110D8Z / *Basic Research Initiatives* | Project (Number/Name)<br>010 / *Basic Research Initiatives* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 010: *Basic Research Initiatives* | 11.960 | 26.195 | 36.577 | 3.966 | - | 3.966 | 4.110 | 4.155 | 4.328 | 4.430 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

The Basic Research Initiatives project, P010, includes Strategic Support for Basic Research (SSBR) and the Minerva Research Initiative.

SSBR supports oversight, policies, and initiatives to create conditions that allow defense basic research investments to producing high-payoff, transformative scientific breakthroughs for the Department. SSBR initiatives support the five Basic Research Office strategic goals: (1) support the 10 modernization priorities; (2) coordinate and conduct oversight of DoD basic research programs; (3) improve the science and engineering workforce and public outreach; (4) enhance university-industry collaboration; and (5) engage with the academic research community and international partners.

The Minerva Research Initiative, a Department of Defense basic research program in the social sciences directed by the Office of the Secretary of Defense (OSD), funded in partnership with Air Force and Navy University Research Initiatives and executed by the Office of Naval Research and the Air Force Office of Scientific Research, seeks to build a fundamental understanding of the sources of present and future conflict.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Strategic Support for Basic Research (SSBR) | 2.000 | 3.163 | 3.966 |
| ***Description:*** The SSBR program creates conditions for defense basic research investments capable of producing high-payoff, transformative scientific breakthroughs for the Department. SSBR initiatives support the five Basic Research Office strategic goals: (1) drive the direction of DoD basic research investments; (2) coordinate and conduct oversight of DoD basic research programs; (3) improve the science and engineering (S&E) workforce and public outreach; (4) enhance university-industry collaboration; and (5) engage with the academic research community and international partners.<br><br>***FY 2020 Plans:***<br>Conduct workshops for scientific situational awareness. Continue convening national research leaders to provide expert perspectives on potential breakthroughs and barriers of advancement in rapidly evolving fields of basic research including a second year of the Dean's Roundtable. Continue studies of the effectiveness of past DoD investments and high priority basic research in advancing new technologies and new capabilities for the Nation. As part of the USD(R&E) mission, continue to analyze university-related business practices for efficiency and maintenance of research integrity. Organize and execute a competition for the I-Corps@DoD program, and conduct a review of I-Corps projects. Continue to iteratively refine communication and outreach efforts, such as site visits and the STIx #conference to increase awareness of DoD basic research programs.<br><br>***FY 2021 Plans:***<br>Conduct workshops for scientific situational awareness. Continue convening national research leaders to provide expert perspectives on potential breakthroughs and barriers of advancement in rapidly evolving fields of basic research including a third | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 1 | **R-1 Program Element (Number/Name)**<br>PE 0601110D8Z / *Basic Research Initiatives* | **Project (Number/Name)**<br>010 / *Basic Research Initiatives* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| year of the Dean's Roundtable. Continue studies of the effectiveness of past DoD investments and high priority basic research in advancing new technologies and new capabilities for the Nation. As part of the USD(R&E) mission, continue to analyze university-related business practices for improvement and efficiency and support for scientific expertise to oversee science and engineering initiatives. Organize and execute a competition for the I-Corps@DoD program, and conduct a review of I-Corps projects. Continue to iteratively refine communication and outreach efforts, such as site visits and the STIx #conference to increase awareness of DoD basic research programs.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Level of effort is consistent between FY 2020 and FY 2021. Small changes reflect Office of the Secretary of Defense (OSD) interest in basic research. | | | |
| ***Title:*** Minerva Research Initiative | 10.235 | 11.414 | - |
| ***Description:*** The Minerva Research Initiative includes three primary components: (1) a university-based social science basic research grant program, funded in partnership with Air Force and Navy University Research Initiatives; (2) the Defense Education and Civilian University Research (DECUR) Partnership program for the professional military education (PME) institutions; and (3) a collaboration with the Congressionally-established United States Institute of Peace to award research support to advanced graduate students and early career scholars working on security and peace. All components contribute to Minerva's goals of revitalizing connections between DoD and academic social science communities and building cultural and foreign area knowledge on topics ranging from China-Russia great power competition, National Defense Strategy (NDS) strategic priorities, to geopolitical power projection strategies in a multi-polar world. This deeper scientific understanding will provide a more informed basis to shape doctrine, analysis, and other strategic and operational decisions made by war planners and warfighters.<br><br>***FY 2020 Plans:***<br>All full proposal applicants from civilian universities and Professional Military Education institutions who applied to the 2019 Minerva Funding Opportunity Announcement (FOA) or the Defense Education Civilian University Research (DECUR) Partnership 2019 will be notified that no new awards will be made, except with congressional funds and Service contributions. Additionally, over 30 universities will be notified that all ongoing projects (23) who have received full awards will be terminated early.<br><br>Full proposal applicants from civilian universities and Professional Military Education institutions who applied under the Defense Education Civilian University Research (DECUR) Partnership to the 2019 Minerva Funding Opportunity Announcement (FOA) will be notified of award selection. From the 2019 university FOA, awards will be made on peer/near-peer competition and on foreign malign influence, using funds associated with the FY 2019 and FY 2020 congressional adds, respectively. New awards will not be made, except with congressional funds and Service contributions. | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 1 | **R-1 Program Element (Number/Name)**<br>PE 0601110D8Z / *Basic Research Initiatives* | **Project (Number/Name)**<br>010 / *Basic Research Initiatives* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| OUSD(R&E) funding for the Minerva Research Initiative will end in FY 2021 resulting from the Defense Wide Review.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>DWR: Funding for the Minerva Research Initiative will end in FY 2021 resulting from the Defense Wide Review. | | | |
| **Accomplishments/Planned Programs Subtotals** | 12.235 | 14.577 | 3.966 |

| | FY 2019 | FY 2020 |
|---|---|---|
| ***Congressional Add:*** Program Increase for Minerva Research Initiative<br>***FY 2019 Accomplishments:*** Continue to support successful ongoing university-led research projects and execute 12-15 new projects based on input from DoD stakeholders. This includes additional projects aligned with recent Congressional interest, such as those on peer and near-peer statecraft, supported by the Congressional increase to the Minerva budget.<br>***FY 2020 Plans:*** The Minerva Research Initiative will use the FY 2020 congressional add to award foreign malign influence from the 2019 university-wide FOA. | 1.960 | 2.000 |
| ***Congressional Add:*** Defense Experimental Program to Stimulate Competitive Research (DEPSCOR)<br>***FY 2019 Accomplishments:*** Defense Experimental Program to Stimulate Competitive Research (DEPSCoR) is a legislated program that helps build the national infrastructure for research and education by funding research activities in science and engineering (S&E) responsive to the needs of national defense. Participation in this program is limited to states that meet eligibility criteria as outlined in the authorizing language. The program is intended to increase the number of university researchers and improve the capabilities of institutions of higher education (IHEs) in eligible jurisdictions to perform competitive S&E research relevant to the Department. IHEs in eligible states will be invited to compete for awards in areas identified by the Department in broad agency announcements.<br>***FY 2020 Plans:*** DEPSCoR will build on the program started in FY19 to expand the DoD research landscape. The program will include increasing funding for Service capacity building projects, outreach to research institutions that have less engagement with the DoD and a stand-alone DEPSCoR competition. | 12.000 | 12.000 |
| ***Congressional Add:*** Cyber<br>***FY 2020 Plans:*** A multi-disciplinary research program will be initiated to conduct basic research in the resiliency and protection of cyber-networks and cyber physical systems in use defense-wide, or parts of a critical infrastructure to support military operations. The program will seek to explore on how to develop rigorous approaches for detection and attribution of attacks by: (1) malicious agents and foreign powers; (2) automatic | - | 8.000 |

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| **Appropriation/Budget Activity**<br>0400 / 1 | **R-1 Program Element (Number/Name)**<br>PE 0601110D8Z / *Basic Research Initiatives* | **Project (Number/Name)**<br>010 / *Basic Research Initiatives* |

| | FY 2019 | FY 2020 |
|---|---|---|
| prevention and recovery of critical systems through a combination of mathematics; (3) computer science and artificial intelligence; and (4) prediction of human-cyber interactions. | | |
| **Congressional Adds Subtotals** | 13.960 | 22.000 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 1 | R-1 Program Element (Number/Name)<br>PE 0601110D8Z / *Basic Research Initiatives* | Project (Number/Name)<br>060 / *Vannevar Bush Faculty Fellowship* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 060: *Vannevar Bush Faculty Fellowship* | 27.091 | 29.000 | 34.297 | 31.599 | - | 31.599 | 32.272 | 32.833 | 33.679 | 34.364 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

The Vannevar Bush Faculty Fellowship program supports world-class researchers in scientific areas of critical importance to DoD and ensures the cultivation of exceptional talent. Fellows' research spans a broad set of emerging scientific areas with transformative potential, including Quantum Information Science, Novel Engineered Materials, Cognitive Neuroscience, Engineering Biology, Applied Mathematics and Statistics, Manufacturing Science and others. The program fosters close connections between academia and the defense science and engineering enterprise, a primary goal of SSBR efforts. Fellows provide the Department the deep scientific expertise from today's leading research universities and collaborate with defense scientists and engineers. This program actively engages and coordinates basic research across the Department.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Vannevar Bush Faculty Fellowship (VBFF) Program | 29.000 | 34.297 | 31.599 |

***Description:*** The Vannevar Bush Program ensures the DoD has a research portfolio that supports creative, innovative, and productive university researchers. The objectives of the program are to: (1) support scientific research that may lead to extraordinary outcomes; (2) educate and train student and post-doctoral researchers for the defense and national security workforce; (3) foster long-term relationships between university researchers and the Department; (4) familiarize select university researchers and their students with DoD's current and future challenges through research and engagement with DoD-employed scientists; and (5) increase the number of exceptionally talented technical experts that are contributing to DoD's mission.

***FY 2020 Plans:***

Support 55 Vannevar Bush Fellows and collaborative research efforts with 25 Laboratory University Collaboration Initiative (LUCI) Fellows from DoD Service Laboratories. LUCI fellows engage in a three-year basic research collaboration between Vannevar Bush Fellows in fields of critical interest to the Department. Review and update program focus topic areas with input from DoD S&T community. Organize and execute a competition to select a new class of Vannevar Bush Fellows. Organize and conduct the Vannevar Bush annual meeting, including DoD laboratory tours. Facilitate connections between new Fellows and DoD scientists and engineers. Organize and conduct a program review and site visits to monitor the research progress by Vannevar Bush Fellows and their DoD collaborators. Organize and execute a competition for the LUCI program. Conduct review of LUCI projects in DoD laboratories and report the scientific progress and impacts. Organize a study group to introduce and educate Vannevar Bush Faculty Fellows to national security challenges.

***FY 2021 Plans:***

Support 55 Vannevar Bush Fellows and collaborative research efforts with 25 Laboratory University Collaboration Initiative (LUCI) Fellows from DoD Service Laboratories. LUCI fellows engage in a three-year basic research collaboration between Vannevar

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| **Appropriation/Budget Activity**<br>0400 / 1 | **R-1 Program Element (Number/Name)**<br>PE 0601110D8Z / *Basic Research Initiatives* | **Project (Number/Name)**<br>060 / *Vannevar Bush Faculty Fellowship* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Bush Fellows in fields of critical interest to the Department. Review and update program focus topic areas with input from DoD S&T community. Organize and execute a competition to select a new class of Vannevar Bush Fellows. Organize and conduct the Vannevar Bush annual meeting, including DoD laboratory tours. Facilitate connections between new Fellows and DoD scientists and engineers. Organize and conduct a program review and site visits to monitor the research progress by Vannevar Bush Fellows and their DoD collaborators. Organize and execute a competition for the LUCI program. Conduct review of LUCI projects in DoD laboratories and report the scientific progress and impacts. Organize a study group to introduce and educate Vannevar Bush Faculty Fellows to national security challenges.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Level of effort decreases between FY 2020 and FY 2021 due to departmental prioritization. | | | |
| **Accomplishments/Planned Programs Subtotals** | 29.000 | 34.297 | 31.599 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
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| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 1: *Basic Research* | **R-1 Program Element (Number/Name)**<br>PE 0601120D8Z / *National Defense Education Program (NDEP)* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 100.850 | 132.743 | 144.074 | 100.241 | - | 100.241 | 106.285 | 108.249 | 110.084 | 112.385 | Continuing | Continuing |
| 120: *National Defense Education Program (NDEP)* | 100.850 | 132.743 | 144.074 | 100.241 | - | 100.241 | 106.285 | 108.249 | 110.084 | 112.385 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

The National Defense Education Program (NDEP) fosters and enhances the Department of Defense's (DoD) ability to access high-quality science, technology, engineering, and mathematics (STEM) talent vital to national defense now and in the future. NDEP is executed by the Office of the Under Secretary of Defense for Research and Engineering (USD(R&E)). NDEP's portfolio includes workforce development programs, such as the Science, Mathematics, and Research for Transformation (SMART) program; Military family programs, such as the Military Child Program (MCP); STEM Education and Outreach; and the Manufacturing Engineering Education Program (MEEP). These programs provide a pathway to the best and the brightest minds through a continuum of DoD workforce development approaches, which include: (1) broadening STEM literacy in K through College continuum to prepare for postsecondary success in STEM disciplines and providing DoD and the Nation enduring access to talent needed to address ever-changing future defense workforce needs; (2) providing awareness of the Department as a STEM workplace of choice for scientists and engineers through programs and outreach; (3) leading the Departmental STEM strategic efforts to ensure alignment with the workforce and mission requirements; and (4) leveraging strategic partners with a shared mission in identifying innovative approaches to developing the Nation's current and future STEM talent.

The NDEP aligns to the National Defense Strategy and the DoD science and technology (S&T) priorities. The program is also aligned to the 2018 Federal STEM Education Strategic Plan, and the DoD STEM Strategic Plan. NDEP components engage in assessment and evaluation practices as outlined by the Office of Management and Budget and the Government Accountability Office.

The SMART program awards highly competitive scholarships-for-service to undergraduate and graduate students in 21 STEM academic disciplines and hires the students, upon graduation, into DoD's workforce. As part of the SMART experience, scholars engage in internships that allow for relevant hands-on research and work experiences in DoD facilities, thereby enhancing their educational experience. Since its inception as a pilot program in FY 2005, SMART has awarded approximately 3,000 scholarships to students ranging from undergraduate to doctoral studies. To date, approximately 2,000 students have completed their academic pursuit and transitioned into DoD employment. Approximately 1,200 participants have successfully completed the program through their DoD Service commitment, of which 71 percent of those participants continue to be employed by DoD SMART ensures the Department has a steady infusion of high-quality technical talent, prepared in areas of critical importance to DoD, and ready to apply their technical knowledge, skills, and abilities to fulfill DoD's mission.

The MCP provides dependents of members of the Armed Forces educational and outreach opportunities in STEM to prepare for pathways in STEM-related careers. Additionally, MCP also provides assistance to STEM teachers at elementary or secondary schools at which a significant number of military dependents are enrolled. Section 233 of the National Defense Authorization Act (NDAA) for FY 2015, and the Consolidated and Further Continuing Appropriations Act, 2015, authorized the establishment of this Pilot Program. By FY 2021, the pilot program will be absorbed into the DoD STEM portfolio of program activities.

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| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 1: *Basic Research* | **R-1 Program Element (Number/Name)**<br>PE 0601120D8Z / *National Defense Education Program (NDEP)* |

STEM Education and Outreach fosters activities to support and cultivate STEM talent with minds for innovation, diversity of thought, and the technical agility to sustain the Department's competitive edge. In order to build a workforce that brings in an expansion of ideas to solve national defense needs and challenges, the DoD recognizes the need for increased participation of underserved groups in STEM activities and education programs. Initiatives include investing, promoting, and participating in national-level STEM programs and efforts, as well as providing authentic hands-on STEM experiences for students and teachers across the Nation.

The DoD is consistently looking for innovative scientific and technological solutions to address current and future military requirements. The MEEP will enhance existing or establish new education programs that support manufacturing engineering.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 135.610 | 92.074 | 99.145 | - | 99.145 |
| Current President's Budget | 132.743 | 144.074 | 100.241 | - | 100.241 |
| Total Adjustments | -2.867 | 52.000 | 1.096 | - | 1.096 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | 52.000 | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | -2.844 | - | | | |
| • Increase for SMART Program and International Genetically Engineered Machine (iGEM) | - | - | 5.000 | - | 5.000 |
| • Re-alignment to PE 060110D8Z | - | - | -3.000 | - | -3.000 |
| • Economic Assumption | - | - | -0.094 | - | -0.094 |
| • Other Adjustments | -0.023 | - | -0.810 | - | -0.810 |

| Congressional Add Details ($ in Millions, and Includes General Reductions) | FY 2019 | FY 2020 |
|---|---|---|
| **Project:** 120: *National Defense Education Program (NDEP)* | | |
| Congressional Add: *Manufacturing Engineering Education Program (MEEP)* | 15.000 | 15.000 |
| Congressional Add: *STEM Education Program Increase* | 34.691 | 35.000 |
| Congressional Add: *Civics Education* | - | 2.000 |
| Congressional Add Subtotals for Project: 120 | 49.691 | 52.000 |
| Congressional Add Totals for all Projects | 49.691 | 52.000 |

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| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 1: *Basic Research* | **R-1 Program Element (Number/Name)**<br>PE 0601120D8Z / *National Defense Education Program (NDEP)* |

**Change Summary Explanation**

FY 2020 $52.000 million increase:
$15.000 million increase for Manufacturing Engineering Education Program (MEEP)
$35.000 million increase for STEM education
$2.000 million increase for civics education

FY 2021 Realignment for Higher DoD priorities:
$3.000 million adjustment to support the Laboratory University Collaboration Initiative (LUCI) and Multidisciplinary University Research Initiative (MURI) - re-aligned to PE 060110D8Z
$3.000 million increase for SMART program
$2.000 million for International Genetically Engineered Machine (iGEM) investment

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Workforce Development - Science, Mathematics, and Research for Transformation (SMART) Defense Education Program | 64.991 | 71.004 | 77.100 |

***Description:*** Description: SMART is a scholarship-for-service program that provides support to high performing U.S. graduate and undergraduate students in 21 academic science, technology, engineering, and mathematics (STEM) disciplines identified as areas of future workforce priorities for the DoD.

The disciplines align with the Department's Science and Technology (S&T) priorities and emerging scientific research areas such as: Aeronautical and Astronautical Engineering; Biomedical Engineering; Biosciences; Chemical Engineering; Chemistry; Civil Engineering; Cognitive, Neural, and Behavioral Sciences; Computer Science; Electrical Engineering; Environmental Sciences; Geosciences; Industrial and Systems Engineering; Information Sciences; Materials Science and Engineering; Mathematics; Mechanical Engineering; Naval Architecture and Ocean Engineering; Nuclear Engineering; Oceanography; Operations Research; and Physics. Upon completion of their degree, students fulfill a service commitment to the Department on a one-to-one payback per year of education funded.

In part, SMART's success is measured by participants that choose to remain in the DoD workforce beyond their required service commitment. Approximately 1,200 participants have successfully completed the program through their DoD Service commitment, of which 71 percent of those participants continue to be employed by DoD.

Oversight of the SMART program falls under the Office of the Under Secretary of Defense for Research and Engineering (USD(R&E)). Two types of individuals participate in the program: (1) retention scholars who are current DoD employees; and (2) recruitment scholars who are students enrolled in undergraduate and graduate programs and represent new technical expertise for the Department. Internships provide SMART scholars with an opportunity to engage in the DoD science and technology

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| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 1: *Basic Research* | **R-1 Program Element (Number/Name)**<br>PE 0601120D8Z / *National Defense Education Program (NDEP)* |

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| enterprise through research and work experiences in defense laboratories, thereby enhancing their educational experience and understanding the relevance of DoD research priority areas.<br><br>Since FY 2005, approximately 3,000 students have participated in the SMART program at approximately 190 sponsoring facilities. As of October 2018, approximately 2,000 SMART scholars have transitioned into the service commitment phase. To date, these scholars have transitioned as civilian employees into the Air Force, Army, Navy, and other DoD components.<br><br>***FY 2020 Plans:***<br>• Allocate SMART awards to better meet the technical needs of the Department's STEM workforce and sustain the scientific and technological superiority to enable unquestioned battlefield dominance.<br>• Focus ten percent of the awards on disciplines supporting the advancement of Artificial Intelligence, Microelectronics, Biotechnologies, Hypersonics and the remaining DoD priority areas.<br>• Implement a robust recruitment effort to ensure the Department continues to meet the increasing needs of the DoD STEM workforce.<br>• Conduct a SMART Symposium to continually enhance inter-Service collaboration and provide a forum for scholars to network.<br>***FY 2021 Plans:***<br>• Continue to make SMART awards to meet the technical needs of the Department's STEM workforce and sustain the scientific and technological superiority to enable unquestioned battlefield dominance.<br>• Implement a robust recruitment effort focusing on disciplines supporting the advancement of Artificial Intelligence, Microelectronics, Biotechnologies, Hypersonics, and the remaining DoD priority areas, within the DoD to ensure the Department continues to meet the increasing needs of the DoD STEM workforce.<br>• Conduct a SMART Symposium to continually enhance inter-Service collaboration and provide scholars a networking forum.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Additional funding will support the continuing education of the current SMART scholars and award ~200-250 new scholarships to help meet the DoD's workforce needs. | | | |
| ***Title:*** Military Families - Pilot Program to Enhance the Preparation of Dependents of Members of the Armed Forces for Careers in STEM (Military Child Pilot Program or MCCP)<br><br>***Description:*** The MCPP was formally established by the FY 2015 National Defense Authorization Act (NDAA), Section 233, and the Consolidated and Further Continuing Appropriations Act, 2015. The objectives of the program are to enhance the preparation of dependents of members of the armed forces for careers in STEM and to provide assistance to STEM teachers at elementary or secondary schools at which a significant number of military dependents are enrolled. The Department currently provides in-classroom STEM program support to students and teachers in covered schools. | 11.281 | 11.483 | 0.000 |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 1: *Basic Research* | **R-1 Program Element (Number/Name)**<br>PE 0601120D8Z / *National Defense Education Program (NDEP)* |

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***FY 2020 Plans:***<br>• Continue conducting targeted outreach to military-dependent students, their teachers, and their families through in-classroom and out-of- school programs and provide additional STEM resources, greater awareness of DoD STEM opportunities and careers, and reach a younger military child population.<br>• Continue providing activities through a cooperative agreement award to a Consortium of partners from academia, industry, and not-for-profit organizations with a shared mission in developing future STEM talent.<br>***FY 2021 Plans:***<br>The Military Child Pilot Program Authority expires at the end of FY 2020. The program will fully integrate into the STEM Education and Outreach task described below.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Decrease in funding, $11.5M, from FY 2020 to FY 2021, due to transfer of MCPP from a standalone program to one that is integrated with the overall STEM Education and Outreach effort. | | | |
| ***Title:*** STEM Education and Outreach | 6.780 | 9.587 | 21.141 |
| ***Description:*** STEM Education and Outreach fosters activities to support and cultivate STEM talent with minds for innovation, diversity of thought, and the technical agility to sustain the Department's competitive edge. In order to build a workforce that brings in an expansion of ideas to solve national defense needs and challenges, the DoD recognizes the need for increased participation of underserved groups in STEM activities and education programs. Investments are made to promote participation in national-level STEM programs and initiatives and provide authentic hands-on experiences for students and teachers across the globe. STEM Education and Outreach manages activities, in support of the Department's STEM Strategic Plan, to attract, inspire, and develop exceptional STEM talent across the education continuum that includes internships, robotics and math competitions, and mentoring through partnerships with industry.<br>***FY 2020 Plans:***<br>• Continue STEM Education and Outreach activities that provide authentic hands-on experiences to students and teachers and evaluate the effectiveness of the increased outreach.<br>• Participate in inter- and intra-departmental collaboration with stakeholders to achieve Federal and DoD STEM objectives.<br>• Finalize the Department's new STEM Strategic Plan.<br>***FY 2021 Plans:***<br>• Will continue to provide STEM Education and Outreach activities with emphasis on authentic hands-on experiences to students and teachers and evaluate the effectiveness of the increased outreach. | | | |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 1: *Basic Research* | **R-1 Program Element (Number/Name)**<br>PE 0601120D8Z / *National Defense Education Program (NDEP)* |

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| • Will continue to participate in inter- and intra-departmental collaboration with stakeholders to achieve Federal and DoD STEM objectives.<br>• Will finalize the Department's new STEM Strategic Plan.<br>• Will fully integrate Military Child Program into all STEM Education and Outreach efforts.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The increase in funding $11.5M from FY 2020 to FY 2021 due to transfer of the MCPP from a standalone program to one that is integrated with the overall STEM Education and Outreach effort. | | | |
| ***Title:*** BIOTECH International Genetically Engineered Machine (iGEM) Competition<br>***Description:*** In order to build a BIOTECH workforce that brings in an expansion of ideas to solve national defense needs and challenges, the DoD recognizes the need to support domestic programs that motivate young people to pursue education and career opportunities in biotechnology. iGEM is an international biotechnology competition that attracts students from more than 40 countries around the globe by providing a mentor-based program that builds science and engineering skills to foster the next generation of BIOTECH leaders. Increasing U.S. participation in iGEM aligns with the Department's BIOTECH roadmap, and will facilitate the development of the domestic biotechnology workforce.<br>***FY 2021 Plans:***<br>• Increase U.S. participation in iGEM to include teams from 30 states and 3 Service Academies.<br>• Prioritize teams that include a DoD-supported scientist as mentor, and with teammates from underserved groups.<br>• Communicate DoD's support for U.S. BIOTECH workforce development.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>New effort in FY 2021 for International Genetically Engineered Machine (iGEM) investment. | - | - | 2.000 |
| **Accomplishments/Planned Programs Subtotals** | 83.052 | 92.074 | 100.241 |

| | FY 2019 | FY 2020 |
|---|---|---|
| ***Congressional Add:*** Manufacturing Engineering Education Program (MEEP) | 15.000 | 15.000 |
| ***FY 2019 Accomplishments:*** • Published a funding opportunity announcement with specific community college and academia initiatives within manufacturing engineering.<br>• With support from DoD Components, issued a funding opportunity announcement for Manufacturing Engineering Education Pilot initiatives. | | |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 1: *Basic Research* | **R-1 Program Element (Number/Name)**<br>PE 0601120D8Z / *National Defense Education Program (NDEP)* |

| | FY 2019 | FY 2020 |
|---|---|---|
| • Awarded one MEEP award, with two pending.<br>***FY 2020 Plans:*** • Support regional fabrication and certification training labs. | | |
| ***Congressional Add:*** STEM Education Program Increase<br>***FY 2019 Accomplishments:*** • Awarded a five year grant to support the Barry Goldwater Foundation Scholarships for DoD related STEM disciplines. The funding provides an additional 240 scholarship awards annually.<br>***FY 2020 Plans:*** • Expand on existing STEM education, outreach and workforce development programs through a FOA.<br>• Support DoD and Federal STEM Education Strategy in building strong foundations STEM for literacy, diversity and inclusion, and developing the future STEM workforce.<br>• Ensure that efforts implement and execute effective program measures. | 34.691 | 35.000 |
| ***Congressional Add:*** Civics Education<br>***FY 2020 Plans:*** • Support civics education programs. | - | 2.000 |
| **Congressional Adds Subtotals** | 49.691 | 52.000 |

**D. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**E. Acquisition Strategy**

N/A

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 1: *Basic Research* | **R-1 Program Element (Number/Name)**<br>PE 0601228D8Z / *Historically Black Colleges and Universities and Minority-Serving Institutions* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 39.006 | 38.568 | 52.708 | 30.975 | - | 30.975 | 31.637 | 32.186 | 33.016 | 33.688 | Continuing | Continuing |
| 448: *Historically Black Colleges and Universities and Minority-Serving Institutions* | 39.006 | 38.568 | 52.708 | 30.975 | - | 30.975 | 31.637 | 32.186 | 33.016 | 33.688 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

This program element (PE) provides support for Historically Black Colleges and Universities and Minority-Serving Institutions (HBCU/MI) in fields of science and engineering that are important to national defense. The Department of Defense (DoD) HBCU/MI program encourages participation of small minority schools as well as large minority research institutions. The program is authorized by 10 U.S.C. § 2362 and is funded by annual appropriations. This competitive program provides support through grants, cooperative agreements, or contracts for research, education assistance, and instrumentation purchases.

Work in this PE provides a foundation to enhance participation of HBCUs/MIs in DoD research. Programs are structured to: Build infrastructure; strengthen research and educational opportunities at HBCUs/MIs and increase the number of minority graduates in the science, technology, engineering, and mathematics (STEM) disciplines; and build a more diverse pool of scientists and engineers to meet future workforce needs.

Work in this PE is performed by the Services' Research Offices and DoD Laboratories (includes the Army Research Laboratory and the Air Force Research Laboratory) for Centers of Excellence (COE). Centers currently funded through cooperative agreements include Autonomy, Cyber Security, Research Data Analysis, STEM Scholars, and Minority Women in STEM.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 40.320 | 30.708 | 31.261 | - | 31.261 |
| Current President's Budget | 38.568 | 52.708 | 30.975 | - | 30.975 |
| Total Adjustments | -1.752 | 22.000 | -0.286 | - | -0.286 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | 22.000 | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | -0.649 | - | | | |
| • SBIR/STTR Transfer | -1.096 | - | | | |
| • Other Adjustments | -0.007 | - | -0.256 | - | -0.256 |
| • Economic Assumption | - | - | -0.030 | - | -0.030 |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 1: *Basic Research* | **R-1 Program Element (Number/Name)**<br>PE 0601228D8Z *I Historically Black Colleges and Universities and Minority-Serving Institutions* |

| Congressional Add Details ($ in Millions, and Includes General Reductions) | FY 2019 | FY 2020 |
|---|---|---|
| **Project:** 448: *Historically Black Colleges and Universities and Minority-Serving Institutions* | | |
| Congressional Add: *HBCU/MI Program Increase* | 10.000 | 22.000 |
| Congressional Add Subtotals for Project: 448 | 10.000 | 22.000 |
| Congressional Add Totals for all Projects | 10.000 | 22.000 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 1 | R-1 Program Element (Number/Name)<br>PE 0601228D8Z / *Historically Black Colleges and Universities and Minority-Serving Institutions* | Project (Number/Name)<br>448 / *Historically Black Colleges and Universities and Minority-Serving Institutions* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 448: *Historically Black Colleges and Universities and Minority-Serving Institutions* | 39.006 | 38.568 | 52.708 | 30.975 | - | 30.975 | 31.637 | 32.186 | 33.016 | 33.688 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

The Historically Black Colleges and Universities and Minority-Serving Institutions (HBCU/MI) program provides support in fields of science and engineering that are important to national defense. The Department of Defense (DoD) HBCU/MI Program encourages participation of small minority schools and large minority research institutions. This competitive program provides support through grants or contracts for research, education assistance, instrumentation purchases, and technical assistance as described below.

• Research. The research grants further knowledge in the basic scientific disciplines through theoretical and experimental activities. Collaborative research allows university professors to work directly with military laboratories or other universities.

• Education. Education assistance funds are used by minority institutions to strengthen their academic programs in science, technology, engineering, and mathematics (STEM), thereby increasing the number of under-represented minorities obtaining undergraduate and graduate degrees in these fields. These grants provide equipment, scholarships, cooperative work/study opportunities, visiting faculty programs, summer internship programs, and a variety of other enhancements designed to support students and to encourage them to pursue careers in STEM.

• Instrumentation purchases. The program allows universities to purchase basic laboratory equipment, such as lasers and spectrometers, for enhancements to the basic research efforts.

• Technical assistance. The funds are used to design programs that enhance the ability of minority institutions to successfully compete for future Defense funding by assisting the HBCU/MI community in areas such as proposal writing and administration of grants and contracts.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Historically Black Colleges and Universities and Minority-Serving Institutions (HBCU/MI) | 28.568 | 30.708 | 30.975 |
| ***Description:*** The HBCU/MI program provides support for research and collaboration with DoD facilities and personnel. The research grants further knowledge in the basic physical scientific and engineering disciplines through theoretical and empirical activities. Collaborative research allows university professors to work directly with DoD laboratories or other universities. | | | |
| ***FY 2020 Plans:*** | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 1 | **R-1 Program Element (Number/Name)**<br>PE 0601228D8Z / *Historically Black Colleges and Universities and Minority-Serving Institutions* | **Project (Number/Name)**<br>448 / *Historically Black Colleges and Universities and Minority-Serving Institutions* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Continue efforts from FY 2019 which include supporting the Centers of Excellence in Artificial Intelligence/Machine Learning, Quantum Science, and Networked Command, Control, and Communications. Conduct annual competition of the HBCU/MI program for basic research, student support, and/or equipment/instrumentation. Continue research and educational collaboration with the DoD laboratories to include the DoD HBCU/MI Summer Intern and Faculty Fellows Program. Monitor established Centers of Excellence in support of the USD(R&E) Science and Technology priorities in the areas of Cyber Security, Research Data Analysis, Autonomy, Center for STEM Scholars, and the Center for Minority Women in STEM, needed to expand STEM opportunities for underrepresented minorities. Conduct annual review of the Centers. Expand the HBCU/MI Program to develop three new Centers of Excellence using the FY 2020 congressional increase. The first Center is an Aerospace Research and Education Innovation Center as directed by Congress ($2M congressional add). Additional program increase funding will be used to establish two new Centers to address R&E priority areas to include Materials Science and Biotechnology. Conduct increased outreach activities, to include, one webinar and two technical assistance workshops to expose HBCUs/MIs to opportunities in DoD. Also continue MSI town hall series in partnership with the National Academies of Science to examine strategies to expand HBCU/MI STEM workforce preparedness and research & education activities. Collaborated with the University Affiliated Research Center (UARC) for Applied Research Laboratory for Intelligence and Security at the University of Maryland – College Park to broaden HBCU/MI partnership portfolios. Projected to commit $1.000 million towards the HBCU/MI and UARC partnership, supporting two HBCU/MI.<br><br>***FY 2021 Plans:***<br>Continue efforts from FY 2020. Conduct annual competition of the HBCU/MI program for basic research, student support, and/or equipment/instrumentation. Continue research and educational collaboration with the DoD laboratories. Monitor established Centers of Excellence in support of the USD(R&E) Science and Technology priorities in the areas of Cyber Security, Research Data Analysis, Autonomy, Center for STEM Scholars, and the Center for Minority Women in STEM, needed to expand STEM opportunities for underrepresented minorities. Conduct annual review of the Centers. Expand the HBCU/MI Program to develop new Centers of Excellence to address R&E priorities in the areas of Artificial Intelligence/Machine Learning, Biotechnology, Quantum Science, and Fully Networked Command, Control, and Communications. Conduct outreach activities, to include one webinar and two technical assistance workshops to expose HBCUs/MIs to opportunities in DoD.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The level of effort is consistent between FY 2020 and FY 2021. Small changes reflect minor budget fluctuations. | | | |
| **Accomplishments/Planned Programs Subtotals** | 28.568 | 30.708 | 30.975 |

| | FY 2019 | FY 2020 |
|---|---|---|
| ***Congressional Add:*** HBCU/MI Program Increase | 10.000 | 22.000 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 1 | **R-1 Program Element (Number/Name)**<br>PE 0601228D8Z / *Historically Black Colleges and Universities and Minority-Serving Institutions* | **Project (Number/Name)**<br>448 / *Historically Black Colleges and Universities and Minority-Serving Institutions* |

| | FY 2019 | FY 2020 |
|---|---|---|
| ***FY 2019 Accomplishments:*** The FY 2019 congressional increase of $10.000 million supports HBCU/MI program expansion and STEM efforts for minority women. Established the Center of Excellence for minority women in STEM at Spelman College, a Historically Black College for women. Established a minority women in STEM Artificial Intelligence/Machine Learning (AI/ML) Initiative at Spelman College. The Initiative is devoted to increasing STEM education and research capabilities in AI/ML through faculty and student training, coursework development, and research collaborations with DoD Service Components.<br><br>Awarded 59 equipment/instrumentation grants for a total of $23.200 million under the FY 2019 HBCU/MI Research and Education Core Program funding opportunity announcement. Placed 101 HBCU/MI student interns and 18 faculty fellows at Army, Navy, and Air Force research laboratories. Issued FY 2020 HBCU/MI funding opportunity announcement for basic research grants. Issued long range HBCU/MI Research and Education Program funding opportunity announcement aligned with USD(R&E) priorities and National Defense Strategy. Hosted two technical assistance workshops collectively attended by 450 representatives from HBCUs/MIs, government, and industry. Collaborated with the OSD Cost Assessment and Program Evaluation Office to enhance HBCU/MI outreach with the intent to increase hiring graduates for DoD STEM-related positions. Monitored established Centers of Excellence in support of the USD(R&E) Science and Technology priorities in the areas of Cyber Security, Research Data Analysis, Autonomy, and the Center for STEM Scholars, needed to expand STEM opportunities for underrepresented minorities. Conducted annual review of the Centers. Participated in congressional site visit to North Dakota Tribal Colleges funded under the HBCU/MI Program. Hosted a research colloquium and poster workshop for DoD summer interns and faculty fellows to showcase their research to principal investigators and DoD program sponsors at the laboratory facilities. Collaborating with the National Academy of Sciences (NAS) to support a series of town hall meetings to examine strategies to expand HBCU/MI STEM education and research activities. The town hall series is a result of NAS' 2019 Report titled, Minority-Serving Institution: America's Underutilized Resource for Strengthening the STEM Workforce. | | |
| ***FY 2020 Plans:*** Expand the HBCU/MI Program to develop three new Centers of Excellence using the FY 2020 congressional increase. The first Center is an Aerospace Research and Education Innovation Center as directed by Congress ($2.000 million congressional add). Additional program increase funding will be used to establish two new Centers to address R&E priority areas to include Materials Science and Biotechnology. Program | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 1 | **R-1 Program Element (Number/Name)**<br>PE 0601228D8Z / *Historically Black Colleges and Universities and Minority-Serving Institutions* | **Project (Number/Name)**<br>448 / *Historically Black Colleges and Universities and Minority-Serving Institutions* |

| | FY 2019 | FY 2020 |
|---|---|---|
| increase funding will also be used to conduct increased outreach activities, additional student opportunities, and to conduct the mandated NAS study. | | |
| **Congressional Adds Subtotals** | 10.000 | 22.000 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 2: *Applied Research* | **R-1 Program Element (Number/Name)**<br>PE 0602000D8Z / *Joint Munitions Technology* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 19.053 | 19.067 | 19.306 | 19.409 | - | 19.409 | 19.833 | 20.178 | 20.695 | 21.116 | Continuing | Continuing |
| 000: *Insensitive Munitions* | 12.867 | 12.883 | 13.069 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| 204: *Enabling Fuze Technology* | 6.186 | 6.184 | 6.237 | 6.288 | - | 6.288 | 6.408 | 6.513 | 6.679 | 6.815 | Continuing | Continuing |
| 076: *Enhanced Munitions* | - | 0.000 | 0.000 | 13.121 | - | 13.121 | 13.425 | 13.665 | 14.016 | 14.301 | Continuing | Continuing |

**Note**

This Program Element (PE) aligns with PE 0603000D8Z, Joint Munitions Advanced Technology. The two project codes within each PE form the 6.2 applied research and 6.3 technology demonstration components of the Joint Enhanced Munitions Technology Program (JEMTP) and the Joint Fuze Technology Program (JFTP). The JEMTP funds applied research efforts from PE 0602000D8Z Project code (P) 076 Enhanced Munitions and technology demonstration efforts from PE 0603000D8Z P077. The JFTP funds applied research efforts from PE 0602000D8Z P204 Enabling Fuze Technology and technology demonstration efforts from PE 0603000D8Z P301.

**A. Mission Description and Budget Item Justification**

This program addresses applied research associated with improving the lethality, reliability, safety, and survivability of munitions and weapon systems. The goal is to develop joint enabling technologies that can be used by the Program Executive Officers (PEOs) as they develop their specific weapon programs. The program invests in research of technologies from a Joint Service perspective, thus maximizing efficiencies, ensuring the development of technologies with the broadest applicability while avoiding duplication of efforts. Increasing the lethality, range and performance of munitions, while striving to increase the safety for our warfighters for munitions in procurement and under development guide program investments. This munitions based science and technology (S&T) program focuses on enhancements in weapon speed, range, and lethality while largely utilizing existing advanced insensitive munitions (IM) technology to maximize weapon safety. U.S. power projection capabilities related to near peer competition are lagging and there is an urgent need to provide US warfighters with increased or new capabilities. The program is striving to develop the most lethal weapons possible and communicating associated risks intelligently, so U.S. warfighters can make informed decisions about their weapon systems capabilities and safe handling requirements. IM compliance requirements remain an important aspect of munitions reliability and readiness and thus will remain a critical characteristic of the program. The 2018 National Defense Strategy denotes that “Challenges to the U.S. military advantage represent another shift in the global security environment. For decades the United States has enjoyed uncontested or dominant superiority in every operating domain. Today, every domain is contested—air, land, sea, space, and cyberspace.” Therefore, the program will invest in technologies that will enable U.S. warfighters to regain the operational and battlefield advantages that technologies can provide through increased performance, range, and lethality to improve the Joint Force military advantages and build a more lethal force. This program's investment portfolio has been aligned to complement, and utilize, the Department's priority technology areas.

Munition Area Technology Groups (MATGs) and Fuze Area Technology Groups (FATGs) are established for each munition and capability area and are tasked with: 1) coordinating, establishing, and maintaining 2025, 2030, and 2035 year technology development plans and roadmaps, 2) coordinating biannual meetings to review technical and programmatic details of each funded and proposed effort, 3) developing and submitting Technology Transition Agreements in coordination with appropriate PEOs for insertion in their weapons system strategic plans / Fuze Technology Development Plans, and 4) interfacing with other MATGs / FATGs and IM / fuze science and technology projects as appropriate. The Joint Enhanced Munitions Technology Program (JEMTP) and Joint Fuze Technology Program (JFTP) utilize a Technical

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 2: *Applied Research* | **R-1 Program Element (Number/Name)**<br>PE 0602000D8Z *I Joint Munitions Technology* |

Advisory Board (TAB) and Technical Advisory Committee (TAC) (consisting of senior Department of Defense (DoD) and Department of Energy (DOE) technology experts and laboratory representatives, plus senior Munitions PEO representatives) to provide program oversight, policy, direction, and priorities during its annual meeting.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 19.126 | 19.306 | 19.589 | - | 19.589 |
| Current President's Budget | 19.067 | 19.306 | 19.409 | - | 19.409 |
| Total Adjustments | -0.059 | 0.000 | -0.180 | - | -0.180 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | -0.056 | - | | | |
| • Other Adjustments | -0.003 | - | -0.161 | - | -0.161 |
| • Economic Assumption | - | - | -0.019 | - | -0.019 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 2 | R-1 Program Element (Number/Name)<br>PE 0602000D8Z / *Joint Munitions Technology* | Project (Number/Name)<br>000 / *Insensitive Munitions* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 000: *Insensitive Munitions* | 12.867 | 12.883 | 13.069 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

The enhanced munitions effort will explore and develop advanced energetics concepts and explosive and propellant materials with the potential to improve the performance, range, and lethality of weapons. Technologies and concepts developed will have the potential to impact multiple munitions technologies with wide applicability to improve the performance, lethality, and range of weapons to ensure the U.S. is not outgunned and outranged on the battlefield of the future.

The Joint Enhanced Munitions Technology Program (JEMTP) investments focus on five Munition Areas: 1) High Performance Rocket Propulsion, 2) Minimum Signature Rocket Propulsion, 3) Blast and Fragmentation Warheads (Area Effects Warheads), 4) Anti-Armor Warheads (Hard Target Effects Warheads), and 5) Gun Propulsion. Munition Area Technology Groups (MATG), under tri-service leadership, have developed technology roadmaps for each Munition Area which is used to guide investments based on goals consistent with the DoD IM Strategic Plan. These IM technologies, alone or in combination, will be incorporated in hardware, simulating real-world munitions, to demonstrate their utility and feasibility as part of Technology Transition Agreements with PEOs.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Enhanced Munitions (previously Insensitive Muntions) | 12.883 | 13.069 | - |
| ***Description:*** Enhance Munitions focuses on the following key areas:<br>- High Performance Propulsion - focuses on the development of technologies to improve the range and speed of HPP systems, rocket motors with Ammonium Perchlorate, and with or without a metal fuel, for rockets and missiles launched from air, ground, and sea platforms.<br>- Minimum Signature Rocket Propulsion (MSP) - focuses on the development and demonstration of technologies to improve range and speed of minimum signature propellant missiles.<br>- Blast and Fragmentation Warheads (BFW) - focuses on the development of technologies to enhance the lethality of blast/ fragmentation munitions.<br>- Anti-Armor Warheads (AAW) - focuses on the development of explosive ingredients, explosives, and warhead technologies for improving performance of AAW munitions.<br>- Gun Propulsion (GP) - focuses on the development and demonstration of technologies in the area of GP systems. | | | |
| ***FY 2020 Plans:***<br>- Evaluation of novel ingredients to increase conventional propellant burn rate for extended range across a suite of munitions. Investigate the addition of new metal materials to increase the trust of solid fuel hypersonic weapons. Demonstrate the printing of a new ignition feature for use in boost motors for hypersonic weapons. | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 2 | **R-1 Program Element (Number/Name)**<br>PE 0602000D8Z / *Joint Munitions Technology* | **Project (Number/Name)**<br>000 / *Insensitive Munitions* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| - Evaluate proven binder materials for high specific impulse (isp) propellant that can be used in multiple minimum signature applications. Downselect modified high sensitivity formulations to six candidates to compare against baseline propellant and conduct performance testing. Formulate propellant using CL-20 and advanced processing to reduce risk.<br>- Additively manufacture fragmenting warheads with low drag to tailor fragment size to target sets. Investigate mach stem detonations for improved fragmentation and lethality. Evaluation of CL-20 in novel explosives for high energy warheads.<br>- Produce precursor materials for new novel explosive material and produce 10 kg of new material, then for studies to ensure viability and optimize material. Evaluate Nano CL-20 for use with multiple binder systems for increased jet performance and penetration. Investigate a Pressed Cured Explosive Utilizing a Thiol-ene Binder System to be formulated with multiple nitramines. Development of a dual explosive shaped charge jet for improved performance.<br>- Evaluate coextruded propellant and novel processing techniques for improved flame spread and thermal consistency over a wide firing range. Investigate novel solventless processing for improved thermal properties and tailored energy release.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>This effort transitions from the Insensitive Munitions (Project Code 000) to Enhanced Munitions (new Project Code 076) in FY 2021. | | | |
| **Accomplishments/Planned Programs Subtotals** | 12.883 | 13.069 | - |

**C. Other Program Funding Summary ($ in Millions)**

| Line Item | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|
| • 0603000D8Z P002: *BA 3 Insensitive Munitions Advanced Technology* | 19.052 | 19.205 | 16.321 | - | 16.321 | 16.724 | 17.103 | 17.621 | 18.040 | Continuing | Continuing |

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 2 | R-1 Program Element (Number/Name)<br>PE 0602000D8Z / *Joint Munitions Technology* | Project (Number/Name)<br>204 / *Enabling Fuze Technology* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 204: *Enabling Fuze Technology* | 6.186 | 6.184 | 6.237 | 6.288 | - | 6.288 | 6.408 | 6.513 | 6.679 | 6.815 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

This RDT&E effort will demonstrate fuze enabling technologies needed to develop weapons that address Joint priority capability areas including ones highlighted by OSD R&E Technology-Focused Modernization and Service S&T priorities such as Hypersonics, Long Range Precision Fires, Air Defense and Scalable Lethality. This effort will develop enabling technologies at the laboratory scale and transition them into Budget Activity (BA) 6.3 demonstration programs for weapons where priority capabilities and technology needs have been identified and validated by the Program Executive Officers (PEOs) and the Heads of the Service Science and Technology (S&T) communities. Mature BA 6.2 fuze technologies will be transitioned, thereby decreasing their program costs and schedule risk and facilitating spin-offs to other munitions within their portfolios.

The Joint Fuze Technology Program (JFTP) investments are focused on capability areas that driven by next generation hypersonic and advanced weapons. The four capability areas are:

1) Extreme Environment Survivable Fuzing, 2) Tailorable Effects Fuzing and Warhead Initiation, 3) High Reliability Safe and Arm Technology, and 4) Target Detection and Burst Point Control.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Enabling Fuze Technology | 6.184 | 6.237 | 6.288 |
| ***Description:*** Enabling fuze technology focuses on the following areas:<br>- Extreme Environmental Survivable Fuzing - challenges are addressed with improved modeling and simulation (M&S) capabilities to provide the computational tools necessary understand extreme weapon environments, test equipment, instrumentation, and analysis techniques that provide basic phenomenology and understanding of the fuze environment, and survivable fuze components are developed to increase the effectiveness of hypersonic munitions by improving the prediction tools and testing methodologies to evaluate the survivability and functionality of future fuzes. Development of these technologies will enable next generation of hypersonic weapon fuzes to survive and function.<br>- Tailorable Effects Fuzing and Warhead Initiation - develops technologies for tailorable effects weapons that encompasses the ability to selectively vary the output of the weapon and the ability to generate selectable effects, initiation and multi-point technologies; electronic safe and arm based multi-point initiators, MicroElectro-Mechanical Systems (MEMS) based multi-point initiators, and smart fuzing for tailorable effects weapons.<br>- High Reliability Safe and Arm Technology - develops high reliability fuzing architectures, fuzing components, and Unexploded Ordnance (UXO) reduction features.<br>- Target Detection and Burst Point Control - develops smaller, more survivable fuze solutions while meeting or exceeding the performance of existing technologies in order to operate in extreme and challenging weapon environments. | | | |
| ***FY 2020 Plans:*** | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 2 | **R-1 Program Element (Number/Name)**<br>PE 0602000D8Z / *Joint Munitions Technology* | **Project (Number/Name)**<br>204 / *Enabling Fuze Technology* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| - Complete and release modeling and simulation tools to Service weapon designers that improve the prediction of the dynamic response of embedded fuze systems for High G shock environments. Conduct High G characterization testing for establishing design guidelines of ruggedizing fuzes in high shock environment.<br>- Investigate government owned detonator formulation for in-line electronic safe arm device (ESAD) used in conventional and High G weapon applications. Develop initial prototypes of fuze critical component technologies for in-line ESADs such as high voltage switches that provide alternatives to current single point solutions.<br>- Investigate prototype designs for miniature safe and arm components for area effects weapons. Develop highly reliable and robust safe and arm sensors for Hypersonic and Counter UAS weapons.<br>- Develop, through additive manufacturing, initial prototype conformal antennas with wideband operation to provide fuze sensor waveforms for target detection. Develop non-RF detection and advanced algorithm technologies for fuzing applications for Counter-UAS weapons. | | | |
| ***FY 2021 Plans:***<br>- Conduct High G characterization testing for establishing design guidelines of ruggedizing fuzes in high shock environment.<br>- Develop fuze critical component technologies for in-line ESADs such as high voltage switches that provide alternatives to current single point solutions.<br>- Demonstrate highly reliable and robust safe and arm sensors for Hypersonic and Counter UAS weapons.<br>- Demonstrate non-RF detection and advanced algorithm technologies for fuzing applications for Counter-UAS weapons. | | | |
| ***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The level of effort is consistent between FY 2020 and FY 2021. Small changes reflect minor budget fluctuations. | | | |
| **Accomplishments/Planned Programs Subtotals** | 6.184 | 6.237 | 6.288 |

**C. Other Program Funding Summary ($ in Millions)**

| Line Item | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|
| • 0603000D8Z P301: *BA 3 Enabling Fuze Advanced Technology* | 6.627 | 6.678 | 6.621 | - | 6.621 | 6.782 | 6.865 | 7.042 | 7.185 | Continuing | Continuing |

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 2 | R-1 Program Element (Number/Name)<br>PE 0602000D8Z / *Joint Munitions Technology* | Project (Number/Name)<br>076 / *Enhanced Munitions* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 076: *Enhanced Munitions* | - | 0.000 | 0.000 | 13.121 | - | 13.121 | 13.425 | 13.665 | 14.016 | 14.301 | Continuing | Continuing |

**Note**

New FY 2021 Project Code; funding re-aligned from P000 Insensitive Munitions.

**A. Mission Description and Budget Item Justification**

The enhanced munitions effort will explore and develop advanced energetics concepts and explosive and propellant materials with the potential to improve the performance, range, and lethality of weapons. Technologies and concepts developed will have the potential to impact multiple munitions technologies with wide applicability to improve the performance, lethality, and range of weapons to ensure the U.S. is not outgunned and outranged on the battlefield of the future.
The Joint Enhanced Munitions Technology Program (JEMTP) investments focus on five Munition Areas: 1) High Performance Rocket Propulsion, 2) Minimum Signature Rocket Propulsion, 3) Area Effects Warheads, 4) Hard Target Effects Warheads, and 5) Gun Propulsion. Munition Area Technology Groups (MATG), under tri-service leadership, have developed technology roadmaps for each Munition Area which is used to guide investments based on goals consistent with the DoD IM Strategic Plan. These IM technologies, alone or in combination, will be incorporated in hardware, simulating real-world munitions, to demonstrate their utility and feasibility as part of Technology Transition Agreements with PEOs.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Ehanced Munitions | - | - | 13.121 |
| ***Description:*** Enhanced Munitions focuses on the following key areas:<br>- High Performance Propulsion (HPP) - focuses on the development of technologies to improve the range and speed of HPP systems, rocket motors with Ammonium Perchlorate, and with or without a metal fuel, for rockets and missiles launched from air, ground, and sea platforms.<br>- Minimum Signature Rocket Propulsion (MSP) - focuses on the development and demonstration of technologies to improve range and speed of minimum signature propellant missiles.<br>- Area Effects Warheads (AEW) - focuses on the development of technologies to improve the effectiveness and reduce the size of Area Effects munitions.<br>- Hard Target Effects Warheads (HTEW) - focuses on the development of explosive ingredients, explosives, and warhead technologies for improving performance of Hard Target Effects munitions.<br>- Gun Propulsion (GP) focuses on the development and demonstration of technologies in the area of GP systems. The development and demonstration of gun propulsion technologies, when applied to munition systems, will improve the range and/or time to target of all gun launched munitions to include small/medium caliber, tank/mortar and large caliber propulsion systems. | | | |
| ***FY 2021 Plans:*** | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 2 | **R-1 Program Element (Number/Name)**<br>PE 0602000D8Z / *Joint Munitions Technology* | **Project (Number/Name)**<br>076 / *Enhanced Munitions* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| - Demonstrate the feasibility of a dual use propellant that can be used as an explosive to create fragments. Investigate novel materials that can be used to reduce weight by replacing the rocket motor casing.<br>- Utilize tailored nitrate esters to increase the specific impulse (isp) of MSP above 15.5. Integrate novel mixing methods to create formulations using proven binder materials like GAP and functionalized nitrate esters for demonstration in systems like Hellfire.<br>- Scale up of novel caged nitramines for use in formulations loaded in Extended Range Canon Artillery (ERCA) and Thor munitions.<br>- Scale up and formulation of novel caged nitramine ingredients for use in multiple formulations.<br>- Demonstrate advanced coatings for improved performance at cold temperature.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>New Project Code in FY 2021. Transfers efforts from Project Code 000 Insensitive Munitions. | | | |
| **Accomplishments/Planned Programs Subtotals** | - | - | 13.121 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 2: *Applied Research* | **R-1 Program Element (Number/Name)**<br>PE 0602230D8Z / *Defense Technology Innovation* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 9.989 | 0.000 | 0.000 | 35.000 | - | 35.000 | 23.000 | 20.000 | 10.000 | 12.000 | Continuing | Continuing |
| 835: *Defense Technology Innovation* | 9.989 | 0.000 | 0.000 | 35.000 | - | 35.000 | 23.000 | 20.000 | 10.000 | 12.000 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

This program will build upon the technology foundation that underlies fifth-generation cellular network (5G) systems as a basis to create the next generation of wireless cellular network and security technologies for military applications. Working in concert with other U.S. Government science and technology agencies, this DoD program will enable the U.S. to regain leadership in emerging wireless technology standards including sixth generation (6G) and beyond by investing in research and workforce development in critical technologies. The development of an engagement plan with other Departments, agencies, industry, and universities will ensure continued U.S. influence in both the international commercial marketplace as well as Government sectors.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 0.000 | 0.000 | 0.000 | - | 0.000 |
| Current President's Budget | 0.000 | 0.000 | 35.000 | - | 35.000 |
| Total Adjustments | 0.000 | 0.000 | 35.000 | - | 35.000 |
| • Congressional General Reductions | 0.000 | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | - | - | | | |
| • Increase for Next Generation ICT | - | - | 35.000 | - | 35.000 |

**Change Summary Explanation**

The increase in FY 2021 through FY 2025 is for Next Generation Information Communications Technology (ICT): 5G to Next Generation (NextG).

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Defense Technology Innovation | - | - | 35.000 |
| ***Description:*** This program will build upon the technology foundation that underlies fifth-generation cellular network (5G) systems as a basis to create the next generation of wireless cellular network and security technologies for military applications. Working in concert with other U.S. Government science and technology agencies, this DoD program will enable the U.S. to regain leadership | | | |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 2: *Applied Research* | **R-1 Program Element (Number/Name)**<br>PE 0602230D8Z / *Defense Technology Innovation* |

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| in upcoming wireless technology standards including sixth generation (6G) and beyond by investing in research and workforce development in critical technologies. The development of an engagement plan with other Departments, agencies, industry, and universities will ensure continued U.S. influence in both the international commercial marketplace as well as Government sectors.<br><br>***FY 2021 Plans:***<br>DoD will work in concert with other U.S. Government science and technology agencies such as the National Science Foundation (NSF) and the National Institute of Standards and Technology (NIST) to execute this investment through collaborative mechanisms such as co-investment in early-stage technology testbeds and focused fellowship programs with NSF. The research areas include:<br>• Radio Frequency (RF) technology including millimeter wave technology and multi-antenna systems<br>• Dynamic spatial spectrum reuse utilizing adaptive machine learning for wireless systems<br>• Highly dynamic spectrum access using spatial and other degrees of freedom<br>• Spatial/spectral/network security techniques<br>• Secure, reconfigurable, and robust network capabilities based on network slicing for creation of virtualized networks and management using software defined networking<br>• Edge computing to provide extremely low latency computing for Next G applications.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Increase in FY 2021 for Next Generation Information Communication Technology (ICT). | | | |
| **Accomplishments/Planned Programs Subtotals** | - | - | 35.000 |

**D. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

N/A

**E. Acquisition Strategy**

N/A

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 2: *Applied Research* | **R-1 Program Element (Number/Name)**<br>PE 0602234D8Z / *Lincoln Laboratory* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 47.891 | 49.647 | 52.317 | 41.080 | - | 41.080 | 42.176 | 43.013 | 44.259 | 45.261 | Continuing | Continuing |
| 534: *Lincoln Laboratory* | 47.891 | 39.672 | 42.101 | 37.580 | - | 37.580 | 38.676 | 39.513 | 40.759 | 41.761 | Continuing | Continuing |
| 535: *Technical Intelligence* | 0.000 | 6.483 | 6.716 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| 815: *Cyber Security, Science and Engineering* | 0.000 | 3.492 | 3.500 | 3.500 | - | 3.500 | 3.500 | 3.500 | 3.500 | 3.500 | Continuing | Continuing |

**Note**

Funding re-aligned from Project Code 535 to PE 0603288D8Z, Project Code 177: Technology Watch/Horizon Scan, in accordance with OUSD(R&E) re-organization.

**A. Mission Description and Budget Item Justification**

The MIT Lincoln Laboratory (MIT LL) research project 534 is an advanced technology research and development effort conducted through a cost reimbursable contract with the Massachusetts Institute of Technology (MIT). The MIT LL project supports innovative, multi-disciplined research that addresses critical national security problems. The LL project funds innovations that directly lead to the development of new system concepts, technologies, components, and materials in support of Department of Defense (DoD) missions. Funding supports high-risk, high-payoff research, which provides unique and specialized capabilities for the current and emerging needs of the DoD. The project funds nine technology areas. Note: In FY 2019, the tenth technology area, Cyber Security, Science and Engineering, moved to individual project code 815.

Of the technology areas, there are four core-technology areas: Advanced Devices; Optical Systems and Technology; Information, Computation and Exploitation Sciences; and Radio-Frequency (RF) Systems and Technologies. There are four emerging-technology initiatives: Advanced Materials and Processes; Quantum System Sciences; Biomedical Sciences and Technology; and Autonomous Systems. There is one Integrated Systems technology area, which focuses on combining novel component-level technologies to create system-level technology solutions for important DoD problems.

These nine technology areas provide critical capabilities that support all DoD mission areas pursued at the Laboratory. The categories are selected in consultation with the Office of the Under Secretary of Defense, Research and Engineering (OUSD(R&E)), are aligned with DoD Communities of Interest (CoI), and with guidance from other DoD agencies to address technology as well as system needs. The research in these categories adapts to solve emerging DoD problems as well as longstanding problems to which new technology advances can be applied. The individual efforts in each area are selected with the goal of enhancing DoD capabilities significantly, rather than incrementally.

Supporting these and other priority technology and capability areas are work efforts titled Technical Intelligence, project 535. The Technical Intelligence project provides global science and technology (S&T) awareness and context in order to assist the DoD decision-makers plan for an uncertain future. The program uses intelligence-based and open-source information to characterize today's global S&T environment, exploiting novel technology watch and horizon scanning (TW/HS) tools to identify

nascent and disruptive technologies that will shape tomorrow's future. The program complements this with tailored technical assessments that identify the military relevance, research opportunities, and policy recommendations for emerging and disruptive technologies.

Supporting these and other priority technology and capability areas are work efforts titled Cyber Security, Science and Engineering under project code 815, which began in FY 2019. The Cyber Security, Science and Engineering research project 815 supports innovative research that addresses critical national security problems in cyber. The project funds innovations that directly lead to the development of new system concepts, technologies, and algorithms in support of Department of Defense (DoD) missions. Funding supports high-risk, high-payoff research, which provides unique and specialized capabilities for the current and emerging needs of the DoD.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 51.479 | 52.317 | 53.317 | - | 53.317 |
| Current President's Budget | 49.647 | 52.317 | 41.080 | - | 41.080 |
| Total Adjustments | -1.832 | 0.000 | -12.237 | - | -12.237 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | -1.823 | - | | | |
| • Other Adjustments | -0.009 | - | -0.380 | - | -0.380 |
| • Economic Assumption | - | - | -0.045 | - | -0.045 |
| • Re-alignment to PE 0603288D8Z | - | - | -6.812 | - | -6.812 |
| • Reduction for Defense Wide Review | - | - | -5.000 | - | -5.000 |

**Change Summary Explanation**

In FY 2021, $6.812 million is realigned from Project Code 535 to PE 0603288D8Z, Project Code 177: Technology Watch/Horizon Scan, in accordance with OUSD(R&E) re-organization.

Defense-Wide Review: The FY 2021 funding request was reduced by $5.000 million during DWR to realign funds for higher priority DoD missions.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | | | | | | | | | Date: February 2020 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 2 | | | | | R-1 Program Element (Number/Name)<br>PE 0602234D8Z / *Lincoln Laboratory* | | | | Project (Number/Name)<br>534 / *Lincoln Laboratory* | | | |
| **COST ($ in Millions)** | **Prior Years** | **FY 2019** | **FY 2020** | **FY 2021 Base** | **FY 2021 OCO** | **FY 2021 Total** | **FY 2022** | **FY 2023** | **FY 2024** | **FY 2025** | **Cost To Complete** | **Total Cost** |
| 534: *Lincoln Laboratory* | 47.891 | 39.672 | 42.101 | 37.580 | - | 37.580 | 38.676 | 39.513 | 40.759 | 41.761 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

The nine Lincoln Laboratory (LL) research areas that comprise the overall research and development portfolio are described below.

Four core-technology areas:

• Advanced Devices emphasizes the development of devices and subsystems utilizing microelectronic, photonic, biological, and chemical technologies to enable new approaches to Department of Defense (DoD) systems. Efforts include technologies for high power Radio Frequency (RF) devices; multi-function, highly integrated lasers; fast and sensitive imagers; and mechanical microsystems for autonomous systems.

• Optical Systems and Technology focuses on developing optical technologies for visible, infrared, and wide band spectroscopic sensing as well as communications systems. The efforts include high energy lasers; scalable focal plane imaging technology; photonic integrated circuits; optical system prototypes; and associated phenomenology measurements.

• Information, Computation and Exploitation Sciences develops novel architectures, tools, and techniques for the processing, fusion, interpretation, computation, and exploitation of multi-sensor, multi-intelligence data. Efforts include innovative hardware and software technologies for graph processors and cloud computing; artificial intelligence (AI) and graph algorithms for analytics, including deep learning algorithms; multi-intelligence analytics, including open-source data processing techniques; and human-machine interfacing and automation technologies to enhance warfighter effectiveness and ability to work with advanced computing systems.

• Radio Frequency (RF) Systems and Technology focuses on RF technologies to enhance warfighting capabilities in radars, electronic warfare (EW), and communications. Efforts include development of next generation phased arrays; ultra-wideband RF systems; compact RF systems; small satellite RF payload; and advanced algorithms for jammer mitigation and EW.

Four emerging-technology areas:

• Advanced Materials and Processes emphasizes research in new materials for additive manufacturing and emerging nanoscale materials. Efforts include research in understanding and controlling diamond chemical vapor deposition to support emerging and future applications; novel growth and transfer strategies for low-defect III-V devices; microwave circuits built with 3D printing; programmable shape change materials; and microsystems using metamaterials.

• Quantum System Sciences focuses on the development of quantum-based technologies that support sensing, communication, computation, and algorithms using quantum information. Efforts include the demonstration of scalable computation platforms, magnetic field sensing using highly-compact, atomic-like defects in diamond, prototyping revolutionary quantum networking systems and technology, and research into advanced quantum algorithms and their applications.

• Biomedical Sciences and Technology supports the development of bio-engineered and biomedical technologies to aid the warfighter. Efforts include brain imaging technologies; relevant research in brain and cognitive sciences including brain-computer interfacing (BCI); engineered biological systems to aid physiology understanding; and technologies to assess physical performance and enhance injury recovery.

• Autonomous Systems has the objective of developing mobile, autonomous, robotic platforms, as well as sensors and algorithms that support key capabilities needed for a wide range of DoD applications. Efforts span advanced AI and processing; sensors and communications for unmanned platforms; platform designs and energy systems; human-machine interactions; and verification and validation of autonomous systems.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 2 | **R-1 Program Element (Number/Name)**<br>PE 0602234D8Z / *Lincoln Laboratory* | **Project (Number/Name)**<br>534 / *Lincoln Laboratory* |

One system technology area:

• Integrated Systems technology efforts use multiple new technologies to solve important national problems. Efforts selected for funding have an applied research component focused on integrated technology capability or technologies that facilitate greater levels of integrated capability. Projects target key Department of Defense (DoD) warfare domains, including space, air, land, sea surface, and undersea.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Advanced Devices | 5.200 | 5.032 | 5.050 |
| ***Description:*** This project area targets the research and development of unique and innovative components, subsystems, and sensing concepts or methodologies that will enable new solutions to important DoD problems. Activities under this technology area include revolutionary imaging technologies, specialized silicon and compound semiconductor-based devices for radio frequency (RF), analog, mixed-signal, and digital electronics; photonics, optoelectronics and laser technologies; microsystems; components and subsystems enabling advanced computing; and novel devices and concepts for chemical, biological, and radiation sensing. | | | |
| ***FY 2020 Plans:***<br>Efforts will continue developing and advancing new devices for compact optical trapped ion arrays, diamond power transistors, signal processing, and quantum sensing. There will be new efforts in advanced computing and imager capabilities, as well as micro-hydraulic technology for robotics. | | | |
| ***FY 2021 Plans:***<br>In addition to continuing the ongoing activities, the Advanced Devices technology area will support applied research of new components that leverage novel material developments and innovative technology ideas that address national security challenges within national security mission areas. | | | |
| ***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The level of effort is consistent between FY 2020 and FY 2021. Small changes reflect minor budget fluctuations. | | | |
| ***Title:*** Optical Systems and Technologies | 5.500 | 5.379 | 5.385 |
| ***Description:*** The project area conducts research through the development, analysis, and demonstration of novel concepts, technology, and systems for the next-generation of optical systems for the DoD. This area invests in optical systems technologies that fill the critical technology gaps in emerging DoD threat areas, such as anti-access/area denial (A2/AD), counter–weapons of mass destruction (C-WMD), and asymmetric warfare, as well as to develop revolutionary technologies in the traditional DoD mission areas such as intelligence, surveillance, and reconnaissance (ISR), space control, communications, and ballistic missile defense. | | | |
| ***FY 2020 Plans:***<br>Continue development on optical coherent combining and polarized lasers, which will enable a wide variety of applications in areas of HELs, optical imaging, multi-wavelength signal processing, and communications. Continue revolutionary work on | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 2 | **R-1 Program Element (Number/Name)**<br>PE 0602234D8Z / *Lincoln Laboratory* | **Project (Number/Name)**<br>534 / *Lincoln Laboratory* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| computational design of free form optics. Develop technology for advanced spectrometers and optical communications. Begin seminal research into directed energy technologies. Continue development of Light Detection and Ranging (LIDAR).<br>***FY 2021 Plans:***<br>Areas of emphasis will include computational imaging, laser and LIDAR technologies, free-space communication technologies, and space surveillance capabilities.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The level of effort is consistent between FY 2020 and FY 2021. Small changes reflect minor budget fluctuations. | | | |
| ***Title:*** Radio Frequency (RF) Systems and Technologies<br>***Description:*** This project area focuses on research, development, and evaluation of innovative RF technologies and concepts in anticipation of Department of Defense (DoD) and intelligence community requirements for radar, signals intelligence (SIGINT), communications, and electronic-warfare (EW) applications. Key RF challenges include a rapidly expanding threat spectrum, platforms with severely constrained payloads, operations in strong clutter and interference environments, detection of difficult targets, and robustness against sophisticated electronic attack. RF technologies of interest include antennas, filters, transmit/receive modules (high-power amplifier, low-noise amplifier, phase shifter, time domain up-sampling), beamformers (analog, digital, photonic), receivers/exciters (local oscillator, mixers, filters, analog-to-digital converter, digital-to-analog converter), and novel RF packaging concepts. RF systems concepts that address novel analog/digital/photonic architectures and signal processing techniques for improved RF performance are also of interest.<br>***FY 2020 Plans:***<br>Efforts will continue to focus research on advanced RF technologies in support of emerging needs for radar, SIGINT, communications, and EW systems.<br>***FY 2021 Plans:***<br>The selection and evolution of efforts will support the wide range of national security mission areas that rely on new RF technology components and systems. Advances in both front-end RF hardware and back-end RF processing algorithms will be pursued.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The level of effort is consistent between FY 2020 and FY 2021. Small changes reflect minor budget fluctuations. | 4.000 | 4.178 | 4.180 |
| ***Title:*** Information, Computation, and Exploitation Sciences<br>***Description:*** This project area achieves significant technical gains in data processing, computation, and exploitation. The volume, velocity, and variety of information production and consumption in the DoD/Intelligence Community (IC) are growing at exponential rates, requiring the development of innovative ways to deal with this data deluge. Emerging artificial intelligence (AI) / machine learning (ML)-based technologies have the potential to significantly improve military capabilities in traditional domains such as Intelligence, Surveillance, and Reconnaissance (ISR), Command and Control (C2), and Electronic Warfare (EW) in addition to | 5.500 | 5.676 | 5.680 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 2 | **R-1 Program Element (Number/Name)**<br>PE 0602234D8Z / *Lincoln Laboratory* | **Project (Number/Name)**<br>534 / *Lincoln Laboratory* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| new areas such as grey zone operations. The project area is structured around a canonical AI-based decision support architecture that addresses the end-to-end processing chain, which includes data conditioning, algorithms, and human-machine teaming to determine courses of action, as well as the advanced heterogeneous computing required to convert raw data into insight. Furthermore, the program addresses specific DoD/IC challenges such as limited training data and decision process explainability.<br><br>***FY 2020 Plans:***<br>This project area will continue to explore important new technologies and develop solutions within the AI-based decision support architecture framework. The project area successfully addressed many aspects of deep learning techniques for a range of DoD applications and will expand its focus toward cutting-edge predictive analytics and address new computational solutions for AI techniques.<br><br>***FY 2021 Plans:***<br>This project area will continue applied research and development along several key technical thrusts, including predictive and prescriptive analytics, advanced computing technologies, and human-machine teaming, all within the context of the AI-oriented decision support architecture. The portfolio will work to address very large, unlabeled data sets typically associated with challenging DoD problems. These efforts will also address performance and implementation challenges for both small tactical-edge platforms and larger data center applications.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The level of effort is consistent between FY 2020 and FY 2021. Small changes reflect minor budget fluctuations. | | | |
| ***Title:*** Biomedical Sciences and Technology<br><br>***Description:*** This project area focuses on advancing research and development in biosciences and biotechnology for DoD applications. This project area seeks to develop technologies to monitor and enhance warfighter health and performance, and to prevent or predict injury through individualized biological monitoring, analysis, and interventions. Collaborative relationships with academic and medical institutions enable significant contributions in areas that aid warfighter health and well-being, improve public health, in general, and seed new applications for tools and techniques developed through other government investments.<br><br>***FY 2020 Plans:***<br>This project area will continue to develop concepts and technologies in medical sensing, imaging, diagnostics, cognitive analytics, and cellular and molecular engineering with a focus on DoD applications. In FY 2020, significant efforts will continue in developing hardware and systems for improved brain imaging/neuronal sensing. There will also be an increase in research and development in the areas of biomedical imaging and engineered/synthetic biology.<br><br>***FY 2021 Plans:*** | 4.800 | 4.868 | 0.000 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 2 | **R-1 Program Element (Number/Name)**<br>PE 0602234D8Z / *Lincoln Laboratory* | **Project (Number/Name)**<br>534 / *Lincoln Laboratory* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| The Biomedical Sciences and Technology program will be eliminated to focus on the core and emerging technology areas that are more tightly coupled to the laboratories' core competencies.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>DWR: The Biomedical Sciences and Technology program will be eliminated, so the funds can be realigned to address other DoD priorities. | | | |
| ***Title:*** Autonomous Systems<br><br>***Description:*** This project area performs applied research in autonomous robotics to address current and anticipated national security needs. One project area goal is to enable unmanned systems to perform useful tasks in uncertain environments as trusted, capable agents without continuous human operator control. Project elements include the development of autonomy algorithms and technologies, and of infrastructure to quickly develop autonomous systems. Lincoln Laboratory also collaborates with research universities to transfer promising autonomy concepts from academia into prototype systems. Technology areas include perception and world modeling, planning, human-robot interaction, manipulation, learning and adaptation, and robotic platforms. Efforts range in scope from simulation-based seedlings to prototype efforts demonstrating autonomous system capabilities in relevant environments.<br><br>***FY 2020 Plans:***<br>Research will continue to improve current autonomous system capabilities for air, land, sea and cross-domain problem sets with the overall goal to develop more advanced autonomy, in-situ adaptation, and learning in changing, complex environments to reduce risk to warfighters and provide substantial operational advantages. These improvements will encompass both hardware advancements and algorithm improvements for swarm and multi-agent coordination, online machine learning and artificial intelligence, and verification and validation of complex autonomy that interacts with humans and the physical world. Technologies for unmanned and autonomous operations to support important DoD applications, such as undersea mapping, will also continue.<br><br>***FY 2021 Plans:***<br>The Autonomous Systems project area will continue developing advanced autonomy algorithms and technologies to extend the autonomy frontier by developing dynamic decision-making algorithms for low-SWaP systems, improving overall unmanned system efficacy, reducing reliance on human operators while optimally integrating human-based supervision into the overall system, and enabling new system concepts.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The level of effort is consistent between FY 2020 and FY 2021. Small changes reflect minor budget fluctuations. | 3.772 | 3.978 | 3.980 |
| ***Title:*** Quantum System Sciences<br><br>***Description:*** This project area develops methods for sensing, communicating, and processing information using quantum mechanical manipulation not possible with classical computing techniques. Collaborating with major universities, quantum system | 4.900 | 4.973 | 4.975 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 2 | **R-1 Program Element (Number/Name)**<br>PE 0602234D8Z / *Lincoln Laboratory* | **Project (Number/Name)**<br>534 / *Lincoln Laboratory* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| science efforts are establishing a robust scientific foundation. On this foundation, application-oriented developments important for national security are being fostered.<br><br>***FY 2020 Plans:***<br>Continue the research agenda from FY 2019, and include extending capability in quantum communications and control, advancing experimental efforts to continue more strongly integrating efforts with theory and simulation. The quantum networking effort will continue with demonstrations of synchronized high-rate qubit teleportation and the incorporation of preliminary quantum memory systems. Efforts to improve the performance of quantum magnetometers will continue to advance the core elements of the technology.<br>***FY 2021 Plans:***<br>Future work in this project area will focus on the underlying scientific and engineering issues of quantum system science and engineering to ultimately develop approaches for robust fabrication and control of quantum systems. As the engineering principles for individual modalities become sufficiently well developed and can be transitioned to other programs to pursue larger-scale demonstrations, the Quantum System Sciences project area will focus on other applied research topics in quantum information, including emerging computational modalities, interfaces between multiple quantum modalities, and robust and scalable quantum processing architectures.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The level of effort is consistent between FY 2020 and FY 2021. Small changes reflect minor budget fluctuations. | | | |
| ***Title:*** Advanced Materials and Processes<br>***Description:*** This project area develops materials and processes that make a transformative impact on enduring national challenges. Areas of strategic focus are material property customization and material enablers for highly-integrated, miniature platform.<br><br>***FY 2020 Plans:***<br>Continue developing capability to build novel diamond-based devices to push transformative advances in a wide array of fields. Continue to develop advanced techniques for additive manufacturing of ceramics, metamaterials, and other new structures. Explore a new materials-by-design initiative for advanced material development, as well as a new photonic integration platform to benefit a broad set of mission areas.<br>***FY 2021 Plans:***<br>Continue emphasis on advanced materials technologies that underpin small platforms, while continuing to support new processes that will lead to transformational capabilities. Multiscale, multi-material additive manufacturing, as well as other novel processes that combine materials in innovative ways are expected to have a major influence on DoD systems. Further, computational | 3.000 | 3.161 | 3.165 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 2 | **R-1 Program Element (Number/Name)**<br>PE 0602234D8Z / *Lincoln Laboratory* | **Project (Number/Name)**<br>534 / *Lincoln Laboratory* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| materials science and all forms of data-enhanced, accelerated materials development are expected to be emerging areas of interest.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The level of effort is consistent between FY 2020 and FY 2021. Small changes reflect minor budget fluctuations. | | | |
| ***Title:*** Integrated Systems<br><br>***Description:*** This project area combines multiple new technologies to solve important national needs. Projects selected for funding have an applied research component focused on integrated technology capability or technologies that facilitate greater levels of integrated capability. Projects target key DoD warfare domains, including space, air, land, sea surface, and undersea. The intent is to support early work on systems that cut across the conventional categories.<br><br>***FY 2020 Plans:***<br>The efforts in this project area will continue their research agendas from FY 2019 which includes the Wafer-Scale Satellite Bus (Wafer-Sat), Agile MicroSat, the Mobile Diamond Magnetometer, and the Micro Air Vehicle (MAV) Testbed.<br><br>***FY 2021 Plans:***<br>This project area will continue to support efforts that innovate at the system level through architecture, design, and/or introduction of new technologies.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The increase in funding in FY 2021 supports research on urgently needed prototypes of future space-based capabilities, including a revolutionary low-cost, highly integrated waferscale satellite capability and an agile micro-satellite that integrates critical technology needed for low-altitude small satellite missions to support rapid space program demonstrations and innovative DoD-unique payloads, and a quantum sensing magnetometer that would lead to improved navigation in denied environments and in sensing magnetic signatures of interest to the DoD. | 3.000 | 4.856 | 5.165 |
| **Accomplishments/Planned Programs Subtotals** | 39.672 | 42.101 | 37.580 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 2 | R-1 Program Element (Number/Name)<br>PE 0602234D8Z / *Lincoln Laboratory* | Project (Number/Name)<br>535 / *Technical Intelligence* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 535: *Technical Intelligence* | 0.000 | 6.483 | 6.716 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

The Technical Intelligence Program supports strategic intelligence analysis by providing global science and technology (S&T) awareness and context in order to inform Defense technology, engineering & acquisition planning for decision-makers in an uncertain future. The program's primary objectives are to 1) Identify and contextualize emerging disruptive technologies (EDT) for senior leadership; and 2) Track global technology trends that challenge fundamental assumptions underpinning current operations and shaping the future of war. Leveraging technology watch and horizon scanning (TW/HS) tools, and scouting areas of global technology development, the program's end-state is to inform senior leadership on where best to invest resources in technology areas to maintain or regain global competitive advantage. The program complements this with tailored technical assessments that identify the military relevance, research opportunities, and policy recommendations for emerging and disruptive technologies. The Technical Intelligence Program supports the strategic intelligence analysis through providing global science and technology (S&T) awareness and context in order to inform Defense technology, engineering & acquisition decision-makers planning for an uncertain future. The program exploits novel technology watch and horizon scanning (TW/HS) tools to identify nascent and disruptive technologies that will shape tomorrow's future by integrating intelligence-based and open-source information to characterize today's global S&T environment, this characterization, in combination with other technical analysis, will inform strategic decisions for capability development. The program complements this with tailored technical assessments that identify the military relevance, research opportunities, and policy recommendations for emerging and disruptive technologies.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Technical Intelligence | 6.483 | 6.716 | - |
| ***Description:*** The Technical Intelligence Program supports strategic intelligence analysis by providing global science and technology (S&T) awareness and context in order to inform Defense technology, engineering & acquisition planning for decision-makers in an uncertain future. The program's primary objectives are to 1) Identify and contextualize emerging disruptive technologies (EDT) for senior leadership; and 2) Track global technology trends that challenge fundamental assumptions underpinning current operations and shaping the future of war. Leveraging technology watch and horizon scanning (TW/HS) tools, and scouting areas of global technology development, the program's end-state is to inform senior leadership on where best to invest resources in technology areas to maintain or regain global competitive advantage. The program complements this with tailored technical assessments that identify the military relevance, research opportunities, and policy recommendations for emerging and disruptive technologies. Note: In FY 2018, $5.253 million is being executed for this effort, but erroneously shown under Project code 534. | | | |
| ***FY 2020 Plans:***<br>In FY 2020, the Technical Intelligence program will continue to conduct efforts to achieve its primary objectives: 1) Identify and contextualize emerging disruptive technologies (EDT) for senior leadership; and 2) Track global technology trends that challenge fundamental assumptions underpinning current operations and shaping the future of war. Specifically: | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 2 | **R-1 Program Element (Number/Name)**<br>PE 0602234D8Z / *Lincoln Laboratory* | **Project (Number/Name)**<br>535 / *Technical Intelligence* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| • TW/HS Tool Exploitation: Continue operationalization of the TW/HS toolkit, which includes its data analytics tool, ability to conduct two technology Horizon Scans a year, and identify, and ability to track investment data from public, private, and venture capital sources to identify where both US and foreign industries are investing resources in promising areas of capability development.<br>• Technical Assessment Program: Sponsor multiple technical assessment activities that support the community of interest topic areas and more emphasis will be placed on conducting impact assessments of emerging technologies. These assessments will inform the S&T community on direction for future capabilities to support joint and cross domain missions.<br>• Intel Support to S&T: Provide a bridge between the IC and the S&T community to access the most relevant intelligence analysis, coordinate integration of intelligence with capability development, and conduct Red Cell assessments to inform technology investment shaping and strategic direction. An additional function will be to produce an annual S&T Intelligence Needs Plan providing the IC a formal understanding of intelligence requirements for the R&D community.<br>• Wargaming: Integrate emerging threats from kill chain analysis and potentially disruptive technologies from horizon scanning efforts through the DoD wargaming community to better understand the potential of emerging technologies to better inform both the DoD requirements process and the technical capability development process.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding re-aligned from Project Code 535 to PE 0603288D8Z, Project Code 177: Technology Watch/Horizon Scan, in accordance with OUSD(R&E) re-organization. | | | |
| **Accomplishments/Planned Programs Subtotals** | 6.483 | 6.716 | - |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 2 | R-1 Program Element (Number/Name)<br>PE 0602234D8Z / *Lincoln Laboratory* | Project (Number/Name)<br>815 / *Cyber Security, Science and Engineering* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 815: *Cyber Security, Science and Engineering* | 0.000 | 3.492 | 3.500 | 3.500 | - | 3.500 | 3.500 | 3.500 | 3.500 | 3.500 | Continuing | Continuing |

**Note**

Starting in FY 2019, the Cyber Security, Science and Engineering technology area split off from project code 534 to become its own individual project code 815.

**A. Mission Description and Budget Item Justification**

The Cyber Security, Science and Engineering research project focuses on the development of technologies and new techniques for the protection of systems against cyber- attack and exploitation. Efforts include research into technologies for cyber situational awareness, command and control; technology to improve resilience of systems to cyber-attack; and technologies for system exploitation research.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Cyber Security, Science and Engineering | 3.492 | 3.500 | 3.500 |
| ***Description:*** This project conducts research and development, including design, analysis, evaluation, and deployment, of prototype systems to improve the security of computer hardware, software, and networks. Its goal is assure the resilience of Department of Defense (DoD) missions against cyber-attack and cyber-exploitation, with particular emphasis on the overlap between traditional Laboratory mission areas and the cyber domain. Ongoing efforts and areas of concentration include: foundational approaches for integrating traditional and cyber domains, tools and methods to compute threat-based cyber metrics, artificial intelligence (AI) and machine learning-based capabilities supporting cyber analysis and decision making, building trustworthy and resilient mission systems even with untrustworthy components, new cryptographic systems and prototypes, side-channel prevention and exploitation techniques in cyber and cyber-physical systems, and techniques for exploit repurposing. Integral to these efforts are demonstrations of the impact of cyber effects on traditional kinetic systems, the quantitative and repeatable evaluation of prototypes, and deployment of prototype technology to national-level exercises. The cyber security mission area uses Line funding to research new cyber security techniques in anticipation of DoD and Intelligence Community (IC) needs and requirements. | | | |
| ***FY 2020 Plans:***<br>The FY 2020, the project will continue to support research in a broad range of hardware and software areas to improve system cyber resilience, develop new cyber capabilities, and improve the cyber security posture of existing legacy systems. Continuing work includes the development of a resilient mission computer, re-hosting embedded devices for automated vulnerability | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 2 | **R-1 Program Element (Number/Name)**<br>PE 0602234D8Z / *Lincoln Laboratory* | **Project (Number/Name)**<br>815 / *Cyber Security, Science and Engineering* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| discovery, and further development of cryptographic primitives. New efforts will focus on the development of a visualization and exploration environments to enable cyber anomaly, vulnerability and exploitability detection.<br>***FY 2021 Plans:***<br>Continue to develop far-reaching cyber improvements that will significantly improve interactions with the cyber world. The resilient mission computer and secure data-centric computing "moonshot" efforts are intended to deliver game-changing cyber capabilities. New focus areas will be in developing and addressing adversarial AI capabilities and related cyber vulnerabilities.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The level of effort is consistent between FY 2020 and FY 2021. | | | |
| **Accomplishments/Planned Programs Subtotals** | 3.492 | 3.500 | 3.500 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

N/A

**D. Acquisition Strategy**

N/A

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 2: *Applied Research* | **R-1 Program Element (Number/Name)**<br>PE 0602251D8Z / *Applied Research for the Advancement of S&T Priorities* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 47.550 | 59.567 | 60.400 | 60.722 | - | 60.722 | 60.740 | 60.746 | 60.749 | 60.758 | Continuing | Continuing |
| 227: *Applied Research for the Advancement of S&T Priorities* | 47.550 | 59.567 | 60.400 | 60.722 | - | 60.722 | 60.740 | 60.746 | 60.749 | 60.758 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

The Applied Research for the Advancement of Science and Technology (S&T) Priorities (ARAP) program element (PE) enables the early launch of S&T applied research projects to shape Components' investments. The PE focuses on the design, development, and improvement immature technologies and new processes to achieve general mission requirements and to translate promising research into solutions for military needs. In addition, the PE enables concept exploration efforts and studies of alternative concepts. The research projects are aligned with the Department of Defense (DoD) S&T priorities and designated focus areas that include non-system specific technology efforts and feasibility assessments and are formulated and managed by teams of subject matter experts drawn from the Office of the Secretary of Defense, the Military Services, and the Defense Agencies. The PE also provides support to the S&T Communities of Interest (CoIs).

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 60.550 | 62.200 | 60.240 | - | 60.240 |
| Current President's Budget | 59.567 | 60.400 | 60.722 | - | 60.722 |
| Total Adjustments | -0.983 | -1.800 | 0.482 | - | 0.482 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | -8.800 | | | |
| • Congressional Adds | - | 7.000 | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | -0.973 | - | | | |
| • Other Adjustments | -0.010 | - | 0.542 | - | 0.542 |
| • Economic Assumption | - | - | -0.060 | - | -0.060 |

| Congressional Add Details ($ in Millions, and Includes General Reductions) | FY 2019 | FY 2020 |
|---|---|---|
| **Project:** 227: *Applied Research for the Advancement of S&T Priorities* | | |
| Congressional Add: *Per- and Polyfluoroalkyl Substances (PFAS) Modeling* | - | 7.000 |
| Congressional Add Subtotals for Project: 227 | - | 7.000 |
| Congressional Add Totals for all Projects | - | 7.000 |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 2: *Applied Research* | **R-1 Program Element (Number/Name)**<br>PE 0602251D8Z *I Applied Research for the Advancement of S&T Priorities* |

**Change Summary Explanation**

Program adjustments are consistent with higher priority DoD requirements.

In FY 2020:
Program reduced by -$8.800 million for excess growth.
Program increased by $7.000 million for per- and polyfluoroalkyl substances (PFAS) modeling.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 2 | R-1 Program Element (Number/Name)<br>PE 0602251D8Z / *Applied Research for the Advancement of S&T Priorities* | Project (Number/Name)<br>*227 / Applied Research for the Advancement of S&T Priorities* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 227: *Applied Research for the Advancement of S&T Priorities* | 47.550 | 59.567 | 60.400 | 60.722 | - | 60.722 | 60.740 | 60.746 | 60.749 | 60.758 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

The Applied Research for the Advancement of Science and Technology (S&T) Priorities program was established to implement Department-wide technology development portfolios and foster Tri-Service research areas of common interest within cross-cutting S&T efforts. The program has three investment areas: (1) large, three-year applied research programs selected by the S&T Executives; (2) smaller, two-year technology 'seedling' programs nominated by the Communities of Interest (CoIs) to address technology gaps or opportunities; and (3) technical support to the CoIs. The execution of the program by the Office of the Secretary of Defense and the support it provides to the CoIs assures strategic oversight and multi-agency coordination.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Applied Research for the Advancement of S&T Priorities | 46.000 | 47.200 | 54.522 |

***Description:*** The program focuses on fostering tri-service research areas of common interest within cross-cutting S&T efforts that give the joint warfighter a technological advantage. It is intended to focus on emerging areas of science, to build expertise within Department of Defense laboratories, to include investment in laboratory infrastructure and people, and will be a foundation for further investments by the Services following the completion of the projects.

Cross-cutting efforts align with the S&T Priorities, such as Electronic Warfare, Human Systems, Autonomy, and Cyber, as well other focus areas, such as Advanced Materials, Biomedical, Weapons, Quantum, and Command, Control, Communications, Computers and Intelligence.

***FY 2020 Plans:***

Defense Optical Channel Program (DOC-P) ($15 million) (Year 3 of 3):
− Finalize DoD relevant applications for both digital and microwave Free Space Optical.
− Build Free Space Optical brass board terminals for both digital and microwave forms.
− Perform outdoor range testing on new free space optical terminals.
− Validate Modulated laser format for Optical Time Transfer at 2.3 km outdoor range.
− Demonstrate pulsed based Optical Time Transfer.
− Demonstrate Multi-use and Multi-access Optical Time Transfer and communication links with frequency combs.
− Validate propagation losses through free-space Quantum-communication experiments and characterize channel through quantum information metrics.

Enhanced Energetics Effects (EEE) ($15 million) (Year 2 of 3):

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| **Appropriation/Budget Activity**<br>0400 / 2 | **R-1 Program Element (Number/Name)**<br>PE 0602251D8Z / *Applied Research for the Advancement of S&T Priorities* | **Project (Number/Name)**<br>227 / *Applied Research for the Advancement of S&T Priorities* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| − Machine-learning model development, for energetic material synthesis and for propellant burn rate predictions.<br>− In-depth characterization and reaction mechanisms studies of aluminum nanoclusters encapsulated in fullerenes and aluminum-carbon core/shell structures and lab-scale detonation velocity measurements of these materials.<br>− Characterization and testing of aluminized nano-CL20 and amorphous-CL20 explosive and propellant formulations to measure burn rates and detonation velocities.<br>− Begin additive manufacturing production of chosen concept and post-production characterization to include initiator/ignitor, propelling charge, rocket assist grain/motor, and warhead.<br>− Three labs with continuous flow processing equipment will perform a comparative DNAN (2,4-Dinitroanisole) synthesis study, and then start scale-up studies.<br>− A few minimum-smoke and reduced smoke rocket propellant formulation will be chosen for scale up and small-motor testing.<br><br>Topologically Enabled Devices (TEDs) ($14 million) (Year 1 of 3)<br>− Supports parallel efforts (led by the Navy and Air force) to develop next generation memory and optoelectronic devices, also utilizing topological materials.<br>− This program will produce (1) a novel, low-power transistor consuming 100x less energy per operation than state-of-the-art (SOA); (2) non-volatile magnetic memory devices require 100x less power and operating 1000x faster than SOA); (3) a circularly polarized light detector implemented at chip-scale; and (4) an on-chip laser isolater to enable high performance integrated photonic circuits.<br><br>- Selection of next high-impact program for FY 2020 ($1.000 million).<br><br>- Fund seedling projects - for Two Years: FY19 Seedlings (Year 2 of 2): (1) Establishing the Critical Tests for Machine Understanding for Humane-Machine Teaming; (2) 150-Volt Ultra-wide Bandgap High Efficiency RF Amplifier Technology; and (3) FY 2020 award new seedling(s).<br>***FY 2021 Plans:***<br>- Continue FY 2020 Applied Research for the Advancement of S&T Priorities projects: (1) Enhanced Energetics Effects (EEE) (Year 3 of 3); and (2) Topologically Enabled Devices (TEDs) (Year 2 of 3). Select and initiate FY 2021 Applied Research for the Advancement of S&T Priorities project.<br>- Continue to fund selected FY 2020 (to be identified in 3rd Quarter FY 2020) and new FY 2021 (to be identified in 3rd Quarter FY 2021) seedling projects.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:*** | | | |

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| **Appropriation/Budget Activity**<br>0400 / 2 | **R-1 Program Element (Number/Name)**<br>PE 0602251D8Z / *Applied Research for the Advancement of S&T Priorities* | **Project (Number/Name)**<br>*227 / Applied Research for the Advancement of S&T Priorities* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| The decrease reflects changes in budget fluctuations. | | | |
| ***Title:*** S&T Communities of Interest (CoIs)<br>***Description:*** The S&T CoIs effort facilitates cooperation and collaboration among Components; it optimizes the development of critical S&T efforts across the DoD enterprise. The efforts include the development of technology roadmaps and the integration of technology planning. The CoIs select and examine critical technology areas to address gaps or opportunities.<br>***FY 2020 Plans:***<br>- Provide technical support to the CoIs ($6.200 million), i.e., Advanced Electronics; Air Platforms; Autonomy; Biotechnology; Command, Control, Communications, Computers, and Intelligence (C4I); Cyber; Directed Energy - Non-Lethal Weapons; Electronic Warfare; Energy and Power; Ground and Sea Platforms; Human Systems; Kinetic Weapons Technologies; Materials and Manufacturing Processes; Sensors and Processing; and Space.<br>***FY 2021 Plans:***<br>- Continue to provide technical support to the CoIs ($6.200 million), i.e., Advanced Electronics; Air Platforms; Autonomy; Biotechnology; Command, Control, Communications, Computers, and Intelligence (C4I); Cyber; Directed Energy - Non-Lethal Weapons; Electronic Warfare; Energy and Power; Ground and Sea Platforms; Human Systems; Kinetic Weapons Technologies; Materials and Manufacturing Processes; Sensors and Processing; and Space.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The level of effort is consistent between FY 2020 and FY 2021. | 5.567 | 6.200 | 6.200 |
| ***Title:*** Additive Manufacturing (AM) of Energetics<br>***Description:*** Additive manufacturing (AM) of energetics provides the ability for tailored and integrated munitions with enhanced capabilities. Integration of unique printed structures and printed energetics with smart fusing can allow for more agile manufacturing processes with reduced development times. As a cross-service area of interest, the Department of Defense Communities of Interest in Materials and Manufacturing Processes and Weapons Technologies have engaged in discussions to identify areas of collaboration. In order to rapidly advance additive manufacturing of energetics, a joint effort across the services and the Department of Energy would support the programs interested in AM of energetics, such as Program Executive Office for Ammunition, Next Generation Hand-Grenade, Harpoon, and Lightweight torpedo. | 8.000 | - | - |
| **Accomplishments/Planned Programs Subtotals** | 59.567 | 53.400 | 60.722 |

| | FY 2019 | FY 2020 |
|---|---|---|
| ***Congressional Add:*** Per- and Polyfluoroalkyl Substances (PFAS) Modeling | - | 7.000 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 2 | **R-1 Program Element (Number/Name)**<br>PE 0602251D8Z / *Applied Research for the Advancement of S&T Priorities* | **Project (Number/Name)**<br>*227 / Applied Research for the Advancement of S&T Priorities* |

| | FY 2019 | FY 2020 |
|---|---|---|
| ***FY 2020 Plans:*** Implement an Applied Research for the Advanced of S&T Priorities (ARAP) project to assess concerns about the human health and environmental impacts of per- and polyfluoroalkyl substances (PFAS). | | |
| **Congressional Adds Subtotals** | - | 7.000 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 2: *Applied Research* | **R-1 Program Element (Number/Name)**<br>PE 0602668D8Z / *Cyber Security Research* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 14.429 | 14.594 | 25.118 | 15.255 | - | 15.255 | 15.586 | 15.857 | 16.265 | 16.596 | Continuing | Continuing |
| 003: *Cyber Applied Research* | 14.429 | 14.594 | 25.118 | 15.255 | - | 15.255 | 15.586 | 15.857 | 16.265 | 16.596 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

The Cybersecurity Applied Research program (PE: 0602668D8Z) promotes innovative higher risk cyber research to address joint force challenges in full spectrum cyber operations. Through the dedicated funding line the program addresses joint service science and technology (S&T) gaps that influence DoD cyber research priorities and shapes the direction of the wider cyber community. The program integrates both defensive and offensive cyber research to develop interchangeable, defense-wide technology options to meet Combatant Command (CCMD) needs and requirements. To better align itself to the NDS, DoD Cyber Strategy, and Office of Under Secretary of Defense for Research and Engineering (OUSD(R&E)) Road to Dominance cyber initiative, the program recalibrated research thrust areas to pivot towards emphasizing a need for power projection and taking the fight to the adversary. Developing research thrusts areas in: Behavior Cyber Science, Self-Securing Systems, Precise Cyber Effects, and Applied Mathematics for Cyber.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 14.935 | 15.118 | 15.396 | - | 15.396 |
| Current President's Budget | 14.594 | 25.118 | 15.255 | - | 15.255 |
| Total Adjustments | -0.341 | 10.000 | -0.141 | - | -0.141 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | 10.000 | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | -0.338 | - | | | |
| • Other Adjustments | -0.003 | - | -0.126 | - | -0.126 |
| • Economic Assumption | - | - | -0.015 | - | -0.015 |

| Congressional Add Details ($ in Millions, and Includes General Reductions) | FY 2019 | FY 2020 |
|---|---|---|
| **Project:** 003: *Cyber Applied Research* | | |
| Congressional Add: *Leveraging Next Generation Cyber Joint Service Capabilities* | - | 10.000 |
| Congressional Add Subtotals for Project: 003 | - | 10.000 |
| Congressional Add Totals for all Projects | - | 10.000 |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 2: *Applied Research* | **R-1 Program Element (Number/Name)**<br>PE 0602668D8Z / *Cyber Security Research* |

**Change Summary Explanation**

FY 2021 increase in $10.000 million for Leveraging Next Generation Cyber Joint Service Capabilities.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | | | | | | | | Date: February 2020 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 2 | | | | | R-1 Program Element (Number/Name)<br>PE 0602668D8Z / *Cyber Security Research* | | | | Project (Number/Name)<br>003 / *Cyber Applied Research* | | | |
| **COST ($ in Millions)** | **Prior Years** | **FY 2019** | **FY 2020** | **FY 2021 Base** | **FY 2021 OCO** | **FY 2021 Total** | **FY 2022** | **FY 2023** | **FY 2024** | **FY 2025** | **Cost To Complete** | **Total Cost** |
| 003: *Cyber Applied Research* | 14.429 | 14.594 | 25.118 | 15.255 | - | 15.255 | 15.586 | 15.857 | 16.265 | 16.596 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

As adversaries develop more sophisticated technology and tactics and become more skilled and better funded, the cyber S&T community must accelerate the pace of innovative research. Judiciously exploring research under these thrust areas should provide a distinct advantage in future cyber conflicts. Following a review and assessment of emerging joint operational needs, OUSD(R&E) developed four (4) research areas to enhance the DoD's tactical edge in a rapidly evolving cyber domain (described below):

• Behavioral Cyber Science: Exploring the interaction between computers and human behavior by moving beyond binary electronic signals towards understanding human behavior. New insights from behavioral science will increase the effectiveness of tools, increase the effectiveness of the cyber workforce, and improve the utility of cyber solutions. Behavioral cyber science seeks to uncover details about how humans (represented by operators, users, adversaries, and/or defenders) react to cyber actions and how those reactions can be understood, from a behavioral science standpoint, and leveraged to create more effective actions and outcomes.

• Self-Securing Systems: Prevailing in a contested cyber environment will require new sciences and mechanisms for autonomous cybersecurity to protect the increasingly complex weapon systems and platforms that help DoD operators react more quickly to cyber-attacks. Exploring foundational research in self-securing systems will arm future DoD systems with the capability to proactively, autonomously, and seamlessly assess cyber threats. Additionally, future systems will be able to deploy self-defense mechanisms to neutralize cyber-attacks and enable blue forces to maneuver at will. Autonomous cyber defenses will need to apply the most current advances in artificial intelligence research.

• Precise Cyber Effects: Precision offensive campaigns for the cyber domain require accurate and timely predictions of cyber effects to enable DoD leadership to achieve the desired outcomes from cyber operations and help manage risks associated with collateral damage. Exploring methods to derive quantifiable metrics will help improve the precision control of selecting cyber mission targets and raise the accuracy of effects; achieving an understanding of second and third order of effects will provide commanders with a higher confidence of success and limit collateral damage.

• Applied Mathematics for Cyber: Advancing mathematical foundations that are intrinsically linked to all branches of cyber science and technology, will cut across focus areas producing new methods to design, secure, and reason about complex cyber systems. This area of research will characterize the cyber domain, maintain the integrity of data, harden systems, analyze potential solutions, and counter adversarial machine learning.

Advances in these cyber S&T areas will promote strong foundations, while disruptive innovations will create surprise, shape the fight, and ensure a decisive advantage. The research areas are critical to the development of innovative and sustainable research that takes cybersecurity beyond the incremental escalation of attack and defense.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Leveraging Next Generation Cyber Joint Service Capabilities | 14.594 | 15.118 | 15.255 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 2 | **R-1 Program Element (Number/Name)**<br>PE 0602668D8Z / *Cyber Security Research* | **Project (Number/Name)**<br>003 / *Cyber Applied Research* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Description:*** Integrating both defensive and offensive innovative cyber research within the DoD cyber science and technology (S&T) enterprise to develop interoperable, defense-wide technology options that address joint force challenges in full spectrum cyber operations. The 2018 National Defense Strategy (NDS) recognized cyber as an actively contested domain with significant security challenges and potential leap-ahead capabilities for military operations. By focusing on higher risk research ideas with major potential impacts, the Cybersecurity program addresses one of the NDS's mission focus areas of cybersecurity. The program works to advance the state of cybersecurity by judiciously exploring research in the areas of Behavioral Cyber Science; Self-Securing Systems; Precise Cyber Effects; and Applied Mathematics for Cyber. These thrusts provide an opportunity to identify and advance foundational technologies to support all Services and Agencies.<br><br>Research in Behavioral Cyber Science advances understanding and the technical rigor of modeling and predicting human responses to cyber activities that enhance cyber operations through planning, and training. Exploring the interaction between computers and human behavior, moving beyond electronic signals (ones and zeroes) enables development of new insights to human behavior. Exploring Self-Securing Systems, platforms, and networks will help DoD operators react more quickly to cyber-attacks. Equipping future DoD systems with the capability to proactively, autonomously, and seamlessly access cyber threats and deploy self-securing mechanisms to neutralize cyber-attacks, offers blue force an innovative new disruptive capability. Precise Cyber Effects provide scalable cyber options for military cyber commanders to precisely identify and engage specific threats and targets with a high confidence of success. This high-risk research provides a disproportionate advantage in modeling cyber with high variability architectures for blue, gray, and red space that would potentially afford real opportunities. Finally advancements in mathematical foundations of cyber cut across all three thrust areas producing new provable methods to design, secure, and reason about complex cyber systems. There is a need for an array of formal and informal modeling techniques, backed by various rigorous mathematical theories, to capture and support the richness of the cyber domain.<br><br>***FY 2020 Plans:***<br>Performance Assessment Suite for Cyber Mission Force project will integrate research automated for predictive analytics into Joint Artificial Intelligence Center (JAIC) rapid prototyping events at Dreamport. Research will develop a prototype for workflow monitoring, addressing human-in-the-loop protocols by refining simulation-based software. (Behavioral Cyber Science)<br><br>Robust Low-level Cyber Attack-Resilience for Warfighting Vehicles project will develop new attack scenarios/patterns developed through Artificial Intelligence/Machine Learning (AI/ML) based intrusion detection simulators to harden vehicle security. (Self-Securing Systems)<br><br>Autonomous Cyber Defense project will demonstrate a prototype of autonomous cyber defense using deception techniques based on human operator defender goals. The demonstration will test and simulate different AI techniques, using both deception and cyber defense tactics. (Self-Securing Systems) | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 2 | **R-1 Program Element (Number/Name)**<br>PE 0602668D8Z / *Cyber Security Research* | **Project (Number/Name)**<br>003 / *Cyber Applied Research* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Fifth Generation (5G) Secure Co-existence of Advanced Networks (SCAN) project will examine 5G security issues and spectrum opportunities to augment Future Autonomous Battlespace Radio Frequency (RF) with Integrated Communications (FABRIC). (Precise Cyber Effects)<br><br>Stealthy Communications and Situational Awareness project will develop Linear Statistical Network Analysis (LSNA) infused Naval Research Laboratory Extensible Stealthy Protocol (NExtSteP) test-bed and determine the “stealthiness” of throughput, to ensure consistency with the proof-of-concept overlay protocol.(Applied Mathematics)<br><br>Mitigating Adversarial Machine Learning project will investigate evasion, inversion, and extraction attack techniques to enhance the performers understanding of machine learning resilience and its effects on human operator decision support. (Applied Mathematics)<br>***FY 2021 Plans:***<br>Plan for new research efforts to identify and meet objectives under the thrust areas. A list of some of the research under consideration is: Artificial Intelligence/Machine Learning (AI/ML); Countering Adversarial Machine Learning; 5G Vulnerabilities; Exploring 6G Standards; and Exploring Precise Cyber Effects at the Tactical Edge.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Level of effort is consistent between FY 2020 and FY 2021. Small changes reflect minor budget fluctuations. | | | |
| **Accomplishments/Planned Programs Subtotals** | 14.594 | 15.118 | 15.255 |

| | FY 2019 | FY 2020 |
|---|---|---|
| ***Congressional Add:*** Leveraging Next Generation Cyber Joint Service Capabilities | - | 10.000 |
| ***FY 2020 Plans:*** Initiate and harness research opportunities in academic cyber institutes. The effort will leverage existing partnerships with academia to reduce vulnerabilities in our national information infrastructure by promoting higher education, workforce development, and research in cyber defense. These investments will establish mechanisms / foundries for future learning and increase the professional workforce with cyber defense expertise. These efforts will promote investments in key cyber areas at these institutions. | | |
| **Congressional Adds Subtotals** | - | 10.000 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

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| **Appropriation/Budget Activity**<br>0400 / 2 | **R-1 Program Element (Number/Name)**<br>PE 0602668D8Z / *Cyber Security Research* | **Project (Number/Name)**<br>003 / *Cyber Applied Research* |

**D. Acquisition Strategy**

N/A

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 2: *Applied Research* | **R-1 Program Element (Number/Name)**<br>PE 0602751D8Z / *Software Engineering Institute (SEI) Applied Research* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 8.614 | 8.942 | 9.580 | 9.573 | - | 9.573 | 9.712 | 9.749 | 10.001 | 10.204 | Continuing | Continuing |
| 278: *Software Engineering Institute (SEI) Applied Research* | 8.614 | 7.942 | 8.580 | 8.573 | - | 8.573 | 8.712 | 8.749 | 9.001 | 9.204 | Continuing | Continuing |
| 817: *Cyber Security, Applied Research* | 0.000 | 1.000 | 1.000 | 1.000 | - | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | Continuing | Continuing |

**Note**

The Software Engineering Institute (SEI) Applied Research Program Element (PE) develops and evaluates the feasibility and practicality of software and computer science concepts at the applied research level, with the potential to improve future DoD systems through research, development, and application in the SEI Advanced Technology Development Program Element (PE) 0603781D8Z. Promising projects proceed into advanced technology development through this PE.

**A. Mission Description and Budget Item Justification**

The Software Engineering Institute (SEI) Federally Funded Research and Development Center (FFRDC) was established in 1984 as an integral part of the DoD's initiative to identify, evaluate, and transition software engineering technologies and practices. The mission of the SEI is to provide the DoD with technical leadership and innovation through research and development to advance the practice of software engineering and technology. The SEI works across government, industry, and academia to improve the state of software engineering from the technical, acquisition, and management perspectives. The SEI engages in research and development of critical software technologies and tools and collaborates with the larger software engineering research community. It facilitates rapid transition of software engineering technologies into practice and evaluates emerging software engineering technologies to determine their potential for improving software-intensive DoD systems. Since its inception, the SEI has helped to transform the fields of software engineering and acquisition, network security, real-time systems, software architectures, and software-engineering process management.

Software is critical to meeting the Department of Defense's (DoD) increasing demand for national defense systems that are high-quality, affordable, and deployed in a timely way. With growing global parity in software engineering, the DoD must maintain leadership in all aspects of software-based system development, operation, defense, and evolution to avoid strategic surprise. To assist the DoD in retaining a long-term differential advantage over potential adversaries, the Software Engineering Institute (SEI) Applied Research program element (PE) develops and evaluates the feasibility and practicality of software and computer science concepts, with the potential to improve future DoD systems. The research conducted by this PE directly benefits the technical domains Autonomous Systems and Artificial Intelligence (AI), Cyber, and Engineered Resilient Systems.

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 2: *Applied Research* | **R-1 Program Element (Number/Name)**<br>PE 0602751D8Z / *Software Engineering Institute (SEI) Applied Research* |

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 9.279 | 9.580 | 9.662 | - | 9.662 |
| Current President's Budget | 8.942 | 9.580 | 9.573 | - | 9.573 |
| Total Adjustments | -0.337 | 0.000 | -0.089 | - | -0.089 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | -0.335 | - | | | |
| • Other Adjustments | -0.002 | - | -0.080 | - | -0.080 |
| • Economic Assumption | - | - | -0.009 | - | -0.009 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 2 | R-1 Program Element (Number/Name)<br>PE 0602751D8Z / *Software Engineering Institute (SEI) Applied Research* | Project (Number/Name)<br>278 / *Software Engineering Institute (SEI) Applied Research* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 278: *Software Engineering Institute (SEI) Applied Research* | 8.614 | 7.942 | 8.580 | 8.573 | - | 8.573 | 8.712 | 8.749 | 9.001 | 9.204 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

Work conducted under this PE will enable resilient mission assurance in heterogeneous and contested environments through the verification and validation of system performance and architecture. The program will also assist the DoD in retaining a long-term advantage in the areas of software-intensive systems and cyber security by enhancing assurance, exploiting automation and AI, and understanding human-computer interaction.

The SEI Applied Research PE has two main research thrusts with known military applications: (1) Software Engineering, Systems Verification and Validation, and Mission Assurance (formerly Mission Assurance); and (2) Information Assurance. This area is increasingly being applied to AI and autonomous systems.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** SEI Applied Research in the Area of Software Engineering, Systems Verification and Validation, and Mission Assurance (formerly Mission Assurance) | 5.765 | 6.006 | 6.023 |
| ***Description:*** Increasingly complex and AI-enabled systems will require a commensurate increase in sophistication of verification and validation mechanisms. This thrust seeks to develop verification techniques for requirements identification, systems of systems architectures, and virtual integration of components. Additionally, research in this area will enable requirements verification for software assurance, analysis and control of unverified code, and automated repair of damaged code. Software production and code analysis methods developed through this program will also improve the accuracy of behavior prediction of complex software, including AI-enabled systems, in untested environments. | | | |
| ***FY 2020 Plans:***<br>• Create tools to automatically assure untrusted external software components to enable rapid software composition for DoD systems.<br>• Develop AI engineering techniques to train AI systems with expected security properties requiring two to three orders of magnitude less computation and verified security properties under known attacks.<br>• Develop algorithms and approaches to automate code changes that enable developers to quickly and confidently restructure software, including harvesting code for reuse and the ability to replace large-scale software components. | | | |
| ***FY 2021 Plans:*** | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 2 | **R-1 Program Element (Number/Name)**<br>PE 0602751D8Z / *Software Engineering Institute (SEI) Applied Research* | **Project (Number/Name)**<br>278 / *Software Engineering Institute (SEI) Applied Research* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| • Develop automated design conformance checkers, as part of a continuous integration toolchain, to correctly identify significant design non-conformance in order to advance DoD capabilities to rapidly compose software systems, including secure AI/ML systems.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Level of effort is consistent from FY 2020 to FY 2021. Small changes reflect minor budget fluctuations. | | | |
| ***Title:*** SEI Applied Research in the areas of Information Assurance (IA)<br><br>***Description:*** To gain full advantage from data and information generated by software for use in missions, DoD needs to assure its software is free of vulnerabilities. In its complex systems, DoD may use software developed from an unknown supply chain that may include intentionally or unintentionally introduced vulnerabilities. This thrust seeks to develop scalable automated methods to locate, understand, and mitigate the effects of these vulnerabilities. Automated solutions developed through this thrust will be used to discover vulnerabilities in system software source code and to generate proofs of correctness or fault. Additionally, they will be used to model and simulate operational environments to support software and cyber tactics, techniques, and procedures testing.<br><br>***FY 2020 Plans:***<br>• Devise practical formal methods which can be utilized to produce trustworthy and assured software on more complex systems and the emerging technologies of interest to the DoD.<br>• Develop compositional verification techniques to allow the use of multiple enforced components. This enables the use of unverified commodity software components containing non-secure behavior with verified enforcers.<br><br>***FY 2021 Plans:***<br>• Advance compositional verification techniques to allow the use of unverified commodity software components in DoD systems, including secure and robust AI/ML systems.<br>• Use machine learning and semantic analysis of data generated during Continuous Integration/Continuous Delivery to reduce the number of alerts requiring human adjudication during the deployment of multiple situational awareness tools and increase the security of software without slowing the development process.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Level of effort is consistent from FY 2020 to FY 2021. Small changes reflect minor budget fluctuations. | 2.177 | 2.574 | 2.550 |
| **Accomplishments/Planned Programs Subtotals** | 7.942 | 8.580 | 8.573 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 2 | **R-1 Program Element (Number/Name)**<br>PE 0602751D8Z / *Software Engineering Institute (SEI) Applied Research* | **Project (Number/Name)**<br>278 / *Software Engineering Institute (SEI) Applied Research* |

**C. Other Program Funding Summary ($ in Millions)**

| Line Item | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|
| • BA 3, PE# 0603781D8Z: *Software Engineering Institute (SEI)* | 15.016 | 15.111 | 12.598 | - | 12.598 | 12.825 | 13.090 | 13.491 | 13.816 | Continuing | Continuing |

**Remarks**

The SEI Applied Research PE represents a pivot toward more fundamental research that enables the DoD to address longer-term challenges in software technology and engineering. The SEI Applied Research PE bolsters the organic research at the SEI Federally Funded Research and Development Center (FFRDC), enables stronger collaborations between the SEI FFRDC and academia, attracts top researchers to the SEI, and gives the DoD access to top experts in information science, which generally enhances the DoD's ability to benefit from the military applications of research in software and computer science.

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 2 | R-1 Program Element (Number/Name)<br>PE 0602751D8Z / *Software Engineering Institute (SEI) Applied Research* | Project (Number/Name)<br>817 / *Cyber Security, Applied Research* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 817: *Cyber Security, Applied Research* | 0.000 | 1.000 | 1.000 | 1.000 | - | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

Work conducted under this project will enable resilient mission assurance in heterogeneous and contested environments through the verification and validation of system performance and architecture. The program will also assist the DoD in retaining a long-term advantage in the area of cybersecurity by enhancing assurance, exploiting automation, and understanding human-computer interaction.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Cyber Security | 1.000 | 1.000 | 1.000 |
| ***Description:*** Warfighting in the cyber domain often operates at sub-second timescales and across multiple domains of authority. Methods used to accomplish many tasks (e.g., malware analysis, coordinating multiple agents) demand large amounts of time, attention, and special skills and are not scalable. This thrust seeks to develop and increase the use of automation to simplify the completion of these tasks. Example activities include automation of moving target defenses, code artifact reverse engineering, analysis of network flows at enterprise scale, assessing the operating boundaries for Artificial Intelligence (AI) and Machine Learning (ML) algorithms, and development and assessment of workforce skills.<br><br>***FY 2020 Plans:***<br>• Develop means to assure and verify trustworthiness of AI/ML systems via new techniques to continuously assess the operating boundaries for AI/ML algorithms.<br><br>***FY 2021 Plans:***<br>• Develop techniques to evaluate the effectiveness of proposed system defenses against code reuse attacks on multiple architectures and platforms of interest to the DoD including AI/ML systems.<br>• Apply and advance new techniques to continuously assess the operating boundaries for AI/ML algorithms to assure and verify trustworthiness.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>There is no change in the Cyber investment between FY 2020 and FY 2021. | | | |
| **Accomplishments/Planned Programs Subtotals** | 1.000 | 1.000 | 1.000 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 2 | **R-1 Program Element (Number/Name)**<br>PE 0602751D8Z / *Software Engineering Institute (SEI) Applied Research* | **Project (Number/Name)**<br>817 / *Cyber Security, Applied Research* |

**C. Other Program Funding Summary ($ in Millions)**

**Remarks**

**D. Acquisition Strategy**

N/A

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603000D8Z / *Joint Munitions Advanced Technology* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 25.550 | 25.462 | 25.779 | 22.920 | - | 22.920 | 23.483 | 23.944 | 24.639 | 25.200 | Continuing | Continuing |
| 002: *Insensitive Munitions Advanced Technology* | 18.977 | 18.931 | 19.205 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| 301: *Enabling Fuze Advanced Technology* | 6.573 | 6.531 | 6.574 | 6.621 | - | 6.621 | 6.782 | 6.865 | 7.042 | 7.185 | Continuing | Continuing |
| 077: *Enhanced Munitions Advanced Technology* | - | 0.000 | 0.000 | 16.299 | - | 16.299 | 16.701 | 17.079 | 17.597 | 18.015 | Continuing | Continuing |

**Note**

This Program Element (PE) aligns with PE 0602000D8Z, Joint Munitions Technology. The two project codes within each PE form the 6.2 applied research and 6.3 technology demonstration components of the Joint Enhanced Munitions Technology Program (JEMTP) and the Joint Fuze Technology Program (JFTP). The JEMTP funds its applied research efforts using PE 0602000D8Z Project code (P) 076 Enhanced Munitions and its technology demonstration efforts using PE 0603000D8Z P077 Enhanced Munitions Applied Technology. The JFTP funds its applied research efforts using PE 0602000D8Z P204 Enabling Fuze Technology and its technology demonstration efforts using PE 0603000D8Z P301 Enabling Fuze Advanced Technology.

**A. Mission Description and Budget Item Justification**

This program advances and demonstrates munitions components (warheads, propulsion systems, advanced lethality mechanisms, fuzes and fuze components, etc.) in relevant environments with joint applicability. The goal is to demonstrate joint enabling technologies that increase or improve the lethality, range, reliability, safety, and survivability for existing and future weapons systems. The program invests in research of technologies from a Joint Service perspective, thus maximizing efficiencies, ensuring the development of technologies with the broadest applicability while avoiding duplication of efforts. Increasing the lethality, range and performance of munitions, while striving to increase the safety for our warfighters for munitions in procurement and under development guide program investments. This munitions based Science and Technology (S&T) program focuses on enhancements in weapon speed, range, and lethality while largely utilizing existing advanced insensitive munitions (IM) technology to maximize weapon safety. US power projection capabilities related to near peer competition are lagging and there is an urgent need to provide our warfighters with increased or new capabilities. The program will strive to develop the most lethal weapons possible and communicating associated risks intelligently, so U.S. warfighters can make informed decisions about their weapon systems capabilities and safe handling requirements. IM compliance requirements remain an important aspect of munitions reliability and readiness and thus will remain a critical characteristic of the program. The 2018 National Defense Strategy denotes that “Challenges to the U.S. military advantage represent another shift in the global security environment. For decades the United States has enjoyed uncontested or dominant superiority in every operating domain. Today, every domain is contested—air, land, sea, space, and cyberspace.” Therefore, the program will invest in technologies that will enable U.S. warfighters to regain the operational and battlefield advantages that technologies can provide through increased performance, range, and lethality to improve the Joint Force military advantages and build a more lethal force. This program is has aligned its investment portfolio to complement and utilize priority technology areas (hypersonics, autonomy, artificial intelligence/machine learning, and microelectronics) defined by the Under Secretary of Defense for Research and Engineering.

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603000D8Z / *Joint Munitions Advanced Technology* |

Munition Area Technology Groups (MATGs) and Fuze Area Technology Groups (FATGs) are established for each technology area and are tasked with: 1) coordinating, establishing, and maintaining 2025, 2030, and 2035 year technology development plans and roadmaps, 2) coordinating biannual meetings to review technical and programmatic details of each funded and proposed effort, 3) developing and submitting Technology Transition Agreements in coordination with appropriate PEOs for insertion in their weapons system strategic plans / Fuze Technology Development Plans, and 4) interfacing with other MATGs / FATGs and IM / fuze science and technology projects as appropriate. The Joint Enhanced Munitions Technology Program (JEMTP) and Joint Fuze Technology Program (JFTP) utilize a Technical Advisory Board (TAB) and Technical Advisory Committee (TAC) (consisting of senior Department of Defense (DoD) and Department of Energy (DOE) technology experts and laboratory representatives, plus senior Munitions PEO representatives) to provide program oversight, policy, direction, and priorities during its annual meeting.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 25.540 | 25.779 | 26.156 | - | 26.156 |
| Current President's Budget | 25.462 | 25.779 | 22.920 | - | 22.920 |
| Total Adjustments | -0.078 | 0.000 | -3.236 | - | -3.236 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | -0.074 | - | | | |
| • Other Adjustments | -0.004 | - | -0.214 | - | -0.214 |
| • Re-alignment to PE 0603662D8Z | - | - | -3.000 | - | -3.000 |
| • Economic Assumption | - | - | -0.022 | - | -0.022 |

**Change Summary Explanation**

FY 2021 Re-alignment for Higher Priorities:

$3.000 million adjustment to fund concept development of follow-on project within the Networked Communications Capabilities PE 0603662D8Z.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 3 | R-1 Program Element (Number/Name)<br>PE 0603000D8Z / *Joint Munitions Advanced Technology* | Project (Number/Name)<br>002 / *Insensitive Munitions Advanced Technology* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 002: *Insensitive Munitions Advanced Technology* | 18.977 | 18.931 | 19.205 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

The Enhanced Munitions Advanced Technology effort will demonstrate enabling technologies and perform associated applied research that will improve the performance, range, and lethality of existing and future weapons systems. This effort will take promising technologies demonstrated at the laboratory scale and transition them into demonstration programs utilizing generic hardware based munitions in the concept and development stages. Mature demonstrated Enhanced Munitions technology can be transitioned, thereby decreasing the PEO's program costs and schedule risk, facilitating spin-offs to other non-compliant munitions within their portfolios. Technologies demonstrated seek to improve the performance, lethality, and range of weapons to ensure the U.S. is not outgunned and outranged on the battlefield of the future.

The Joint Enhanced Munitions Technology Program (JEMTP) investments focus on five Munition Areas: 1) High Performance Rocket Propulsion, 2) Minimum Signature Rocket Propulsion, 3) Blast and Fragmentation Warheads (Area Effects Warheads), 4) Anti-Armor Warheads (Hard Target Effects Warheads), and 5) Gun Propulsion. Munition Area Technology Groups (MATG), under tri-service leadership, have developed technology roadmaps for each Munition Area which is used to guide investments based on goals consistent with the DoD IM Strategic Plan. These IM technologies, alone or in combination, will be incorporated in hardware, simulating real-world munitions, to demonstrate their utility and feasibility as part of Technology Transition Agreements with PEOs.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Enhanced Munitions Advanced Technology (previously Insensitive Munitions Advanced Technology) | 18.931 | 19.205 | - |
| ***Description:*** Enhanced Munitions Advanced Technology focuses on the following key areas:<br>- High Performance Rocket Propulsion HPP - focuses on the development of technologies to improve the range and speed of HPP systems, rocket motors with Ammonium Perchlorate and with or without a metal fuel, for rockets and missiles launched from air, ground, and sea platforms.<br>- Minimum Signature Rocket Propulsion (MSP) - focuses on the development and demonstration of technologies to improve MS rocket propellant formulations and ingredients, including synthesis, characterization and scale-up; case and packaging design; active and passive venting techniques; rocket motor case design; ignition systems; and thrust mitigation techniques.<br>- Blast and Fragmentation Warheads (BFW) - focuses on the development and demonstration of technologies that when applied enhance the lethality of Blast/Fragmentation munitions.<br>- Anti-Armor Warheads (AAW) - focuses on the development of explosive ingredients, explosives, and warhead technologies for improving performance of AAW munitions.<br>- Gun Propulsion (GP) - focuses on the development and demonstration of technologies in the area of GP systems. The development and demonstration of gun propulsion technologies, when applied to munition systems, will improve the range and/or time to target of all gun launched munitions to include small/medium caliber, tank/mortar and large caliber propulsion systems. | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603000D8Z / *Joint Munitions Advanced Technology* | **Project (Number/Name)**<br>002 / *Insensitive Munitions Advanced Technology* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***FY 2020 Plans:***<br>- Complete the ballistic testing of a HD 1.3 propellant in a new nozzle system for the Missile Defense Agency. Demonstrate venting solution for large rocket motor casing applicable to sidewinder and AMRAAM. Manufacture motors and conduct baseline testing for MK-135 Tomahawk boost motor demonstration. Complete case design and motor geometry using a composite rocket motor case.<br>- Manufacture components and propellant, for assembly and prep for testing an extruded propellant to improve flight motor for air to ground small missile system. Complete hardware design and manufacture for small diameter rocket motor. Conduct testing of extruded propellant to improve performance of ground to ground flight motor. Conduct analysis and optimize the energy management of a small diameter rocket motor system.<br>- Conduct modelling and simulation on down-selected formulations and conduct functionality testing on large diameter indirect fire munitions to demonstrate improved performance. Conduct water pit testing and conduct lethality assessment on novel warhead design for direct fire ammunition warhead. Complete design and analysis for an optimized warhead the fragmentation features with rapid prototyping using additive manufacturing (AM). Scale up and conduct reliability testing of novel warhead initiation booster material.<br>- Conduct modeling and simulation of medium caliber ammunition warhead designs, optimize the design, and build warheads. Scale up and manufacture improved performance explosive for AAWs, load into warheads and conduct basic testing. Procure novel high explosive material, manufacture samples, and prepare to conduct penetration tests on representative hardware.<br>- Fabricate novel material gun cartridge case material, conduct mechanical and specialized testing, and down-select coating material. Design the breech and propelling charge subsystems for a longer range artillery system using a novel ignition mechanism.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>This effort transitions to a new Project Code, Enhanced Munitions Advanced Technology in FY 2021. | | | |
| **Accomplishments/Planned Programs Subtotals** | 18.931 | 19.205 | - |

**C. Other Program Funding Summary ($ in Millions)**

| Line Item | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|
| • 0602000D8Z P000: *BA2 Insensitive Munitions* | 13.037 | 13.178 | 13.362 | - | 13.362 | 13.618 | 13.889 | - | - | Continuing | Continuing |

**Remarks**

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603000D8Z / *Joint Munitions Advanced Technology* | **Project (Number/Name)**<br>002 / *Insensitive Munitions Advanced Technology* |

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 3 | R-1 Program Element (Number/Name)<br>PE 0603000D8Z / *Joint Munitions Advanced Technology* | Project (Number/Name)<br>301 / *Enabling Fuze Advanced Technology* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 301: *Enabling Fuze Advanced Technology* | 6.573 | 6.531 | 6.574 | 6.621 | - | 6.621 | 6.782 | 6.865 | 7.042 | 7.185 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

This program will demonstrate advanced fuze technologies needed to develop weapons that address Joint priority capability areas including ones highlighted by OUSD(R&E) Technology-Focused Modernization and Service Science and Technology (S&T) priorities including Hypersonics, Long Range Precision Fires, Counter UAS Air Defense and Scalable Lethality. This effort will take promising integrated technologies to maturity and demonstrate the maturity utilizing weapon hardware derived from priority capabilities and technology needs identified and validated by the Program Executive Officers (PEOs) and the Heads of the Service S&T communities. Demonstrate mature fuze technology will be transitioned, thereby decreasing their program costs and schedule risk and facilitating spin-offs to other munitions within their portfolios.

Under the Joint Fuze Technology Program (JFTP), investments are focused on specific capability areas that have been identified by Department strategic guidance and are focused on capability areas that are driven by next generation hypersonic and advanced weapons. The four capability areas are: 1) Extreme Environment Survivable Fuzing, 2) Tailorable Effects Fuzing and Warhead Initiation, 3) High Reliability Safe and Arm Technology, and 4) Target Detection and Burst Point Control.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Enabling Fuze Advanced Technology | 6.531 | 6.574 | 6.621 |

***Description:*** Enabling Fuze Advanced Technology focuses on the following key areas:
- Extreme Environment Survivable Fuzing - develops fuze components to increase the effectiveness of hypersonic munitions by improving the prediction tools and testing methodologies to evaluate the survivability and functionality of future fuzes.
- Tailorable Effects Fuzing and Warhead Initiation - develops fuzing for tailorable effects weapons that encompasses the ability to selectively vary the output of the weapon (Dial-a-Yield) and/or the ability to generate selectable effects (e.g., directed blast, fragmentation).
- High Reliability Safe and Arm Technology - develops high reliability fuzing architectures, fuzing components, and Unexploded Ordnance (UXO) reduction features enabling the next generation of cluster munitions to achieve the required <1% UXO goal while Increasing the reliability across the board for future weapon systems.
- Target Detection and Burst Point Control develops technologies enabling smaller, more survivable solutions while meeting or exceeding the performance of existing technologies in order to operate in extreme and challenging weapon environments.

***FY 2020 Plans:***
- Develop fully programmable miniature data recorders for embedded fuzing that can survive extreme hard target fuzing environments. Develop methods to accurately replicate weapon extreme shock and temperature effects on fuzing components and transition to the DoD and Industry fuze community.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603000D8Z / *Joint Munitions Advanced Technology* | **Project (Number/Name)**<br>301 / *Enabling Fuze Advanced Technology* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Develop technologies for efficient/novel generation of firing energy for multi-point fuze systems. Develop fuzing components precision timing between initiation of multi-points and of energetic reactions.<br>- Develop integrated miniature fuze sensor technology for applications in miniature UAV weapons as well as for counter UAV applications. Demonstrate area-effects weapon fuzing subsystem and system-level prototypes and systems in both laboratory and field environments.<br>- Develop miniaturized, low power, target detection device technologies in area-effect weapon simulated target environment.<br>***FY 2021 Plans:***<br>Validate tools and modeling that accurately replicate and record extreme high G loading and high temperature on fuzing components and transition capability to the DoD and Industry weapon fuze community.<br>- Develop and demonstrate technologies for efficient/novel generation of firing energy for multi-point fuze systems for advanced hypersonic warheads.<br>- Develop integrated miniature fuze sensor technology for applications in miniature UAV weapons.<br>- Demonstrate MEMS fuze sensor technology for application in miniature UAV weapons and transition Services' Counter UAS and weaponized UAS programs.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The level of effort is consistent between FY 2020 and FY 2021. Small changes reflect minor budget fluctuation. | | | |
| **Accomplishments/Planned Programs Subtotals** | 6.531 | 6.574 | 6.621 |

**C. Other Program Funding Summary ($ in Millions)**

| Line Item | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|
| • 0602000D8Z P204: *BA2 Enabling Fuze Technology* | 6.263 | 6.327 | 6.431 | - | 6.431 | 6.532 | 6.655 | - | - | Continuing | Continuing |

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 3 | R-1 Program Element (Number/Name)<br>PE 0603000D8Z / *Joint Munitions Advanced Technology* | Project (Number/Name)<br>077 / *Enhanced Munitions Advanced Technology* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 077: *Enhanced Munitions Advanced Technology* | - | 0.000 | 0.000 | 16.299 | - | 16.299 | 16.701 | 17.079 | 17.597 | 18.015 | Continuing | Continuing |

**Note**

Funds in this new Project Code will be used to develop and demonstrate early applied weapons system science and technology (i.e., energetic ingredients, formulations, consolidation techniques, warheads, and propulsion technologies) focused on enhancing weapons lethality, range, and performance in the Joint Enhanced Munitions Technology Program (JEMTP).

**A. Mission Description and Budget Item Justification**

The Enhanced Munitions Advanced Technology effort will demonstrate enabling technologies and perform associated applied research that will improve the performance, range, and lethality of existing and future weapons systems. This effort will take promising technologies demonstrated at the laboratory scale and transition them into demonstration programs utilizing generic hardware based munitions in the concept and development stages. Mature demonstrated Enhanced Munitions technology can be transitioned, thereby decreasing the PEO's program costs and schedule risk, facilitating spin-offs to other non-compliant munitions within their portfolios. Technologies demonstrated seek to improve the performance, lethality, and range of weapons to ensure the U.S. is not outgunned and outranged on the battlefield of the future.

The Joint Enhanced Munitions Technology Program (JEMTP) investments focus on five Munition Areas: 1) High Performance Propulsion - Alternative propulsion designs and systems for increased range, e.g. rotating detonation engines, solid fuel ramjets, highly loaded grain technology, etc.; 2) Minimum Signature Propulsion – new propellant compositions and hybrid propulsion for reduced time to target/increased range; 3) Area Effects Warheads – high performance explosives, reactive materials, multiphase blast, etc.; 4) Hard Target Effects Warheads – improved penetration for shaped charge jets, lethality enhancements for area effects munitions; and 5) Gun Propulsion – novel ignition schemes, advanced propellant design, etc. Munition Area Technology Groups (MATG), under tri- service leadership, have developed technology roadmaps for each Munition Area which are used to guide investments.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Enhanced Munitions Advanced Technology | - | - | 16.299 |
| ***Description:*** Enhanced Munitions Advanced Technology focuses on the following key areas:<br>- High Performance Rocket Propulsion (HPP) - focuses on the development of technologies to improve the range and speed of HPP systems, rocket motors with Ammonium Perchlorate and with or without a metal fuel, for rockets and missiles launched from air, ground, and sea platforms.<br>- Minimum Signature Rocket Propulsion (MSP) - focuses on the development and demonstration of technologies to improve MS rocket propellant formulations and ingredients, including synthesis, characterization and scale-up; case and packaging design; active and passive venting techniques; rocket motor case design; ignition systems; and thrust mitigation techniques.<br>- Area Effects Warheads (AEW) focuses on the development and demonstration of technologies that when applied enhance the lethality of Area Effects munitions. | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603000D8Z / *Joint Munitions Advanced Technology* | **Project (Number/Name)**<br>077 / *Enhanced Munitions Advanced Technology* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| - Hard Target Effects Warheads (HTEW) - focuses on the development of explosive ingredients, explosives, and warhead technologies for improving performance of HTEW munitions.<br>- Gun Propulsion (GP) - focuses on the development and demonstration of technologies in the area of GP systems. The development and demonstration of gun propulsion technologies, when applied to munition systems, will improve the range and/or time to target of all gun launched munitions to include small/medium caliber, tank/mortar and large caliber propulsion systems.<br><br>***FY 2021 Plans:***<br>- Demonstrate BI/FI improvement and firing of MK-135 Tomahawk boost motor. Conduct motor preparations and static motor firing for air defense system.<br>- Manufacture motor case assemblies to support air to ground small motor testing. Conduct testing of extruded propellant to improve Fragment Impact response of ground to ground flight motor. Complete designs and fabricate hardware for testing of a small diameter rocket motor system.<br>- Conduct testing on large diameter indirect fire munitions to demonstrate improved performance while maintaining Fragment Impact, Slow Cookoff, and Sympathetic Reaction response. Finalize the design of AM warhead and conduct water pit testing to compare to the existing baseline warhead. Conduct mini-arena testing of novel warhead booster material and produce full size boosters to conduct testing in all up rounds.<br>- Conduct testing of medium caliber ammunition warheads on full cartridges, in multiple scenarios. Conduct characterization and performance testing on improved performance explosive for HTEWs. Conduct penetration tests on novel high explosive material loaded hardware.<br>- Fabricate prototype novel material gun cartridge cases, and prepare for engineering demonstration testing. Complete the design, assembly and initial testing of the longer range artillery system novel ignition mechanism.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>This new Project Code re-aligns efforts from Project Code 002, Insensitive Munitions Advanced Technology, in FY 2021. | | | |
| **Accomplishments/Planned Programs Subtotals** | - | - | 16.299 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603121D8Z / *SO/LIC Advanced Development* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 0.000 | 0.000 | 5.000 | 4.914 | - | 4.914 | 5.047 | 5.135 | 5.273 | 5.379 | Continuing | Continuing |
| 121: *SO/LIC Advanced Development* | 0.000 | 0.000 | 5.000 | 4.914 | - | 4.914 | 5.047 | 5.135 | 5.273 | 5.379 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

The SUNet enterprise system is an unclassified, secure information platform that allows the user to communicate, analyze, and share information between defense, interagency, and foreign partners. Rested on SUNet are mission specific enclaves used to detect, monitor, understand, and act in the information environment. The SUNet system addresses critical DoD and interagency requirements for an unclassified, secure information platform that jointly supports rapid innovation and RDT&E, combined operational missions, and mission partner information sharing. The SUNet provides defense and interagency partners with an accredited platform that enables secure unclassified information sharing, joint analysis, and advanced RDT&E in support of critical operational missions on a global scale. The platform currently supports more than a dozen sponsoring agencies with a range of missions, including but not limited to research and analysis of publicly available information, Phase 0 shaping, informing and influencing; building partner capacity; and enables rapid, iterative development and fielding of artificial intelligence and machine learning. The SUNet platform enables CTTSO to identify and develop capabilities to combat terrorism and irregular adversaries, and deliver these capabilities to DoD components and interagency partners with a provision of support to US military operations.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 0.000 | 5.000 | 5.100 | - | 5.100 |
| Current President's Budget | 0.000 | 5.000 | 4.914 | - | 4.914 |
| Total Adjustments | 0.000 | 0.000 | -0.186 | - | -0.186 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | - | - | | | |
| • Funding transferred to O&M Labor account PE:0907388D8Z | - | - | -0.179 | - | -0.179 |
| • Negative inflation adjustment | - | - | -0.007 | - | -0.007 |

**Change Summary Explanation**

Funding for SO/LIC Advanced Development was transferred from Combatting Terrorism Technology Support, PE: 0603122D8Z. These funds support the SUNet Enterprise System.

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
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| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603121D8Z / *SO/LIC Advanced Development* |

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** SUNet Enterprise System | - | 5.000 | 4.914 |
| ***Description:*** The SUNet enterprise system is an unclassified, secure information platform that allows the user to communicate, analyze, and share information between defense, interagency, and foreign partners. Rested on SUNet are mission specific enclaves used to detect, monitor, understand, and act in the information environment. The SUNet system addresses critical DoD and interagency requirements for an unclassified, secure information platform that jointly supports rapid innovation and RDT&E, combined operational missions, and mission partner information sharing. The SUNet provides defense and interagency partners with an accredited platform that enables secure unclassified information sharing, joint analysis, and advanced RDT&E in support of critical operational missions on a global scale. The platform currently supports more than a dozen sponsoring agencies with a range of missions, including but not limited to research and analysis of publicly available information, Phase 0 shaping, informing and influencing; building partner capacity; and enables rapid, iterative development and fielding of artificial intelligence and machine learning. The SUNet platform enables CTTSO to identify and develop capabilities to combat terrorism and irregular adversaries, and deliver these capabilities to DoD components and interagency partners with a provision of support to US military operations.<br><br>***FY 2020 Plans:***<br>Initiate an effort to develop, integrate, test, deploy, manage and maintain a SUNet enterprise system with an emphasis on enhanced network engineering, information assurance, cybersecurity monitoring, enterprise governance and policy support, system redundancy and failover, and dedicated help desk to efficiently and effectively support a growing number of users and missions across the platform.<br><br>***FY 2021 Plans:***<br>Continue an effort to develop, integrate, test, deploy, manage and maintain a SUNet enterprise system with an emphasis on enhanced network engineering, information assurance, cybersecurity monitoring, enterprise governance and policy support, system redundancy and failover, and dedicated help desk to efficiently and effectively support a growing number of users and missions across the platform.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Minor decrease reflects inflation adjustment. | | | |
| **Accomplishments/Planned Programs Subtotals** | - | 5.000 | 4.914 |

**D. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

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**E. Acquisition Strategy**

N/A

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| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 789.148 | 168.012 | 116.747 | 51.089 | 19.288 | 70.377 | 72.317 | 73.085 | 75.446 | 76.965 | Continuing | Continuing |
| 484: *Combating Terrorism Technology Support (CTTS)* | 789.148 | 168.012 | 116.747 | 51.089 | 19.288 | 70.377 | 72.317 | 73.085 | 75.446 | 76.965 | Continuing | Continuing |

**Note**

OCO for Base Requirements ($19,288 thousand): OCO for Base Requirements is funding to pay for base budget requirements, that are financed in the OCO budget in order for the Department to comply with the Bipartisan Budget Act (BBA) of 2019.

Defense-Wide Reviews (DWR) - Funding for the CTTS Initiative was reduced by $23,492 thousand resulting from the DWR, which focused on the Secretary's guidance to streamline operations, increase efficiency, and promote greater affordability within the OSD and Defense Agencies and Field Activities in order to ensure the Department's optimum alignment to the National Defense Strategy and DoD strategic guidance, with particular focus on building a more lethal, resilient, agile, and ready force while strengthening alliances, prioritizing cyber and space capabilities, and focusing on innovation to maintain the technological advantage. Base reduction of 17,062 thousand and OCO reduction of 6,430 thousand.

**A. Mission Description and Budget Item Justification**

The Combating Terrorism Technical Support (CTTS) program supports the National Defense Strategy (NDS) and will give those identified peer-to-peer high interest areas increased priority. CTTS also recognizes that many of the combating terrorism requirements already supports many of these high interest areas; to include, increasing lethal capability of U.S. forces at the squad and small unit level; countering Small Unmanned Aerial Systems (drones) overseas and domestically; tunnel detection and mapping in theater and along the Southwest U.S. border; novel body and vehicle armor; detecting and mitigating novel chemical threats against commercial transportation; telematics; covert communications; and the use of machine learning and artificial intelligence.

From a broader perspective, projects remain distributed among 10 mission categories, in line with the interagency Technical Support Working Group (TSWG): Advanced Analytic Capabilities; Chemical, Biological, Radiological, Nuclear, and Explosives; Improvised Device Defeat/Explosives Countermeasures; Investigative and Forensic Science; Irregular Warfare and Evolving Threats; Personnel Protection; Physical Security; Surveillance, Collection, and Operations Support; Tactical Operations Support; and Training Technology Development.

While supporting the NDS, the CTTS program will also continue to identify capabilities to combat terrorism and irregular adversaries and quickly delivers these capabilities to U.S. Defense and interagency users, as well as international partners through rapid research and development, advanced studies, and technical innovation. CTTS continues to expand its partnerships with other Defense and Interagency, as well as with our foreign partners' rapid development and acquisition organizations to leverage their expertise and prevent duplication as it tries to expedite and transition new and innovative capabilities for Defense and interagency users. CTTS is unique in its approach, annually obtaining joint requirements directly from military and law enforcement operators, intelligence analyst, and first responders. The CTTS program is a diverse, advanced technology development effort that capitalizes on interagency and international participation to demonstrate the utility and effectiveness of technology when applied to combating terrorism requirements. This includes rapid technology capability development, testing products, proof-of-concept demonstrations in field applications, operational test and evaluations, and coordinating the transition from development to operational use. For FY 2021, the time from requirements to contracts has been shortened in order to provide solutions even more rapidly to the users. CTTS normally manages approximately 250 individual

projects in support of defense, federal, state, local, and international customers and partners; while also reviewing proposals and negotiating contracts for another 100 requirements prior to the next fiscal year.

The CTTS program justified in the R-2 exhibit identifies the projects fully or partially funded by Congressional appropriations for the CTTS program. However, CTTS also develops technology and provides support using external funds provided by other DoD and federal departments and international partnerships. These projects and support activities are not necessarily reflected in this justification R-2; but the number of activities do reflect positively on the trust and competence that CTTS has earned throughout the Department of Defense and interagency to rapidly conduct critical RDT&E and provide innovative products. The funding and number of requirements from users that CTTS will be able to address in FY 2021 has been reduced by 25% in accordance with the Secretary's directed Defense Wide Review Task 266.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 171.321 | 95.747 | 97.384 | 0.000 | 97.384 |
| Current President's Budget | 168.012 | 116.747 | 51.089 | 19.288 | 70.377 |
| Total Adjustments | -3.309 | 21.000 | -46.295 | 19.288 | -27.007 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | 21.000 | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | -0.029 | - | | | |
| • SBIR/STTR Transfer | -3.280 | - | | | |
| • Funding transferred to O&M Labor account PE:0907388D8Z | - | - | -3.417 | 0.000 | -3.417 |
| • Negative Inflation Adjustment | - | - | -0.098 | 0.000 | -0.098 |
| • Defense Wide Review Reduction | - | - | -17.062 | -6.430 | -23.492 |
| • Transfer OCO2Base to OCO | - | - | -25.718 | 25.718 | 0.000 |

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| ***Title:*** Advanced Analytic Capabilities (AAC) | 6.042 | 7.037 | 5.109 | - | 5.109 |
| ***Description:*** The Advanced Analytic Capabilities (AAC) Subgroup's objective is to develop and deploy integrated analytic capabilities; enabling Commanders, Warfighters, and Mission Partners to share information and make better/faster decisions at the Strategic, Operational, and Tactical levels. AAC projects improve sense-making, decision-making, and data management across a range of mission areas. | | | | | |
| ***FY 2020 Plans:*** | | | | | |

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| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603122D8Z / *Combating Terrorism Technology Support* |

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Enhance Survivability for Close Combat Formations. Initiate development of a system capable of detecting, locating, recording, and analyzing sources of radiated electromagnetic energy for autonomous RF signal collection management.<br>Expand the Competitive Space. Complete the tagging and retrieval of objects from images for the purpose of analysis and real time alerts using machine learning. Complete drone based analytics for in-field mission planning support. Complete development and demonstration of software capable of using open source and other available information to develop a detailed country model comprising iterative models for national, provincial, and local organizational elements across political, economic, military, socioeconomic and cultural domains. Complete development of a computer vision algorithm in order to provide a capability to tag and track objects in a region of interest, such as individuals of interest, vehicles, and/or friendly forces. Complete development of a mesh network of field programmable gate array-based mobile devices for conducting high-performance mobile edge analytics without reach-back to the cloud, enabling support of edge analytics in end-user designated use-cases. Complete development of means of social network analysis to improve understanding of current academic and nontraditional research, contributing to the development of a secure web portal that allows Israeli and U.S. experts to identify early scientific efforts that may relate to Counter Terrorism. Complete the Special Operations Requirement Tool-Operational Environment modeling and visual platform for financial analytics, leveraging the existing visualization tools to conduct robust cost analysis modeling. Initiate development of a data ingestion, storage, formatting and processing system which refines and stores information-products both in a high-throughput data and application environment and deployable as remotely accessible images in support of edge analytics. Initiate development of a capability to inform crisis responses on how to assess the potential for social manipulation via bot networks during a crisis-situation, and develop intervention strategies for reducing the potential for social hysteria and violence.<br>Sustain Combating Terrorism. Completed efforts to enhance capability of experimental software to meet SOF requirements and improve the probability of the software's rapid and successful integration or transition to operational use at SOFWERX in a sandbox-style environment which sources end-users feedback to the vendor. Complete enhancement of Study of Terrorism and Responses to Terrorism (START) Database, updating data, increasing the speed of data refinement, exploring new methodologies, optimizing extant methodologies, and providing data to other Research and Development groups inside and outside of government who similarly drive innovation. Initiate development of algorithms and machine learning methodologies that leverage all available data from multiple sensor platform for tunnel detection. Initiate research and development of new capabilities for investigating and tracing the source of crypto-currency transactions using both commercial tools and intelligence sources. | | | | | |

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| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Integrate with the U.S. Interagency. Complete development of automated software tools for data exploration and extrapolation to derive insight.<br>Irregular Warfare as a Core Competency. Complete development and application of a deterministic open source information prototype that uses current anticipatory analytic approaches to enable forecasting over three to five years to better forecast and project geopolitical turmoil that will drive future Title 10 requirements.<br>***FY 2021 Base Plans:***<br>Enhance Survivability for Close Combat Formations. Complete development of a system capable of detecting, locating, recording, and analyzing sources of radiated electromagnetic energy for autonomous RF signal collection management.<br>Expand the Competitive Space. Continue development of a data ingestion, storage, formatting and processing system which refines and stores information-products both in a high-throughput data and application environment and deployable as remotely accessible images in support of edge analytics. Continue development of a capability to inform crisis responses on how to assess the potential for social manipulation via bot networks during a crisis-situation, and develop intervention strategies for reducing the potential for social hysteria and violence.<br>Sustain Combating Terrorism. Complete development of algorithms and machine learning methodologies that leverage all available data from multiple sensor platform for tunnel detection. Complete research and development of new capabilities for investigating and tracing the source of crypto-currency transactions using both commercial tools and intelligence sources.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Decreases are reflective of the Defense Wide Review reductions. | | | | | |
| ***Title:*** CHEMICAL, BIOLOGICAL, RADIOLOGICAL, NUCLEAR, AND EXPLOSIVES (CBRNE) | 9.832 | 10.510 | 7.961 | - | 7.961 |
| ***Description:*** The CBRNE subgroup's objective is to improve defense capabilities to meet tomorrow's CBRNE threats. To meet this objective, the subgroup focuses on rapid research, development, test and evaluation on threat characterization; materials attribution; personal protective equipment; detection of CBRNE materials at trace and bulk levels at point, proximity and stand-off distances; development of information resources and decision support tools to assist response elements with risk-based decision making; and consequence management for post-event activities.<br>***FY 2020 Plans:*** | | | | | |

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| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Enhance Survivability for Close Combat Formations. Complete the development of a decontamination solution that can be used on skin and wounds and effectively decontaminate chemical and biological warfare agents. Complete development of a low-cost detect-to-identify wearable sensing technology to inform chemical-specialist first responders and warfighters of the presence of a broad range of TIC and CWA vapors. Continue development of a wearable solution that autonomously monitors, detects, and captures threat agents for identification.<br>Sustain CBRNE Units for Defense and the Homeland. Complete development of a low profile tactical SCBA to allow for working in confined spaces, tunnels, and similar access denied environments while providing high quality breathing air. Complete NIOSH certification of a 15-min CBRN protection escape hood capable of fitting in the pocket of a suit jacket that also passes the flammability, heat resistance and CO protection requirements for a combination CBRN/CO capability. Complete development of an explosive trace detector with a limit of detection less than ten picograms for military and common homemade explosives. Complete the development of a novel, innovative non-encapsulating NFPA 1994 Class 1 protective ensemble that will provide Class 1 protection in a low-profile, tactical ensemble. Complete the development of low-cost, disposable multi agent detection paper (MADP) for the rapid, selective, and low cost detection of H, G, and V chemical warfare agents. The MADPs shall be able to detect HD, HN, GA, GB, GD, GF, VX, VR, and VS. Complete development of a CB glove providing National Fire Protection Association (NFPA) 1994, Class 3, protection with greater tactility, durability, dexterity, and comfort. Complete identifying successful operational guidance for decontaminating fentanyl and its analogs. Complete development of low cost chemical sensors for deployment in a network based sensor environment for large area coverage or temporary venue screening of vapor or aerosol chemical threats in transit or outdoor areas. Complete assessment of CBRN filter canister performance under various storage configurations. Continue development of a risk-based decision support model for skin decontamination in the case of dermal exposures to CWAs. Initiate and complete the redesign of the current vacuum sampling devices to accommodate collection of liquid samples for chemical or microbiological forensic analysis. Initiate development of a new USSI to accommodate a broader range of masks and personal protective ensembles. Initiate the development of a respiratory protective device designed for canines that can fit the general working dog population. Initiate the development of a containment system for rapidly encapsulating and transporting objects contaminated with chemical and biological (CB) hazards, such as chemical warfare agents (CWAs) and toxic industrial chemicals (TICs). Initiate validation methods to confirm routine decontamination of personal protection equipment is sufficient to remove emerging threats like toxins (ricin, abrin) or drugs (opioids, fentanyl analogs). Initiate the development of evidence and consensus-based guidance for laundry protocols and decontamination confirmation for personal protective equipment after ricin, abrin, and pharmaceutical-based agent incidents. Initiate the development of a practical application of Surface Enhanced Spatially Offset Raman | | | | | |

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| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Spectroscopy (SESORS) for trace threat detection. Initiate optimizing the methodology for using Alternative Light Sources (ALS) systems to visualize and screen for pharmaceutical-based agent (PBA) threats. Initiate validating laundering techniques for work duty uniforms, bunker gear and personal protective equipment (PPE) traditionally used to remove soot, dusts, blood and other bodily fluids are sufficient for the removal of more toxic compounds such as toxins (e.g. ricin, abrin) or drugs of concern (e.g. opioids, fentanyl analogs). Initiate the evaluation of the effectiveness of commercial bulk filter material for neutralizing or removing chemical gases of emerging threats from enclosed/indoor environments. Initiate improving the ability to detect and characterize chemical and biological (CB) hazards in various subterranean (Sub-T) environments. Initiate collecting empirical data on the transport of aerosol particles in an urban environment to improve mathematical models used for risk assessment and hazard response.<br>Integrate with the U.S. Interagency.<br>Complete development of a test bed for the evaluation of cargo for contraband including special nuclear materials, explosives, drugs, and other potential materials of interest, utilizing muon tomography and electron stopping. Complete development of a research and development test bed for the evaluation of high volume explosive sampling devices with a focus on cargo/container screening. Complete testing and evaluation of a next generation sensors for use in trace, bulk, proximity, and stand-off detection of explosives-based threats. Complete evaluation of enhanced sampling materials and systems for CBRNE threats. Complete development of an advanced analytical database of improvised CB agent production methods. Complete development of an interface that integrates chemical detection data in real time to a central data sharing, management, and storage platform. Continue a multi-year test and evaluation program for the identification and rapid laboratory and field evaluation of emerging commercial and near-commercial explosive detection technologies to facilitate the acceleration, improvement, and fielding of promising capabilities. Continue development of an online database containing feedback on CBRNE detector field performance and test data. Continue updating the current open source chemical and biological recipe inventory to include metadata on each discovered recipe and incorporating recipe and precursor information into a threat recognition guide. Initiate the development of a system to effectively collect, aggregate, and share critical information related to biological samples and laboratory analysis results using a standard format that integrates with currently deployed responder networks.<br>Strengthen Alliances.<br>Complete development of a UK commercialized capability to produce aerosolized chemical and biological hazards for threat characterization across the U.S. and UK government agencies. Complete improvement of a previous biological detector prototype to enhance performance and detection capabilities and align BWA detection capabilities. Continue to identify common research and development gaps and initiate projects that improve the capabilities of military and civilian first responders in handling chemical, biological and radiological | | | | | |

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| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| events. Continue development of a man-portable system that can reliably detect explosives through continuous gas phase monitoring. Initiate the investigation of the detonation of improvised radiological dispersal devices (RDDs) in an urban environment to gain valuable emergency response and forensic information. Initiate international laboratory round robin testing for facilities that are involved with response to biological incidents (e.g. bioterrorism, bio-crimes) in a safe no-fault environment.<br>Support Relationships to Address Significant Terrorist Threats. Continue the systematic evaluation of gas forming reactions that could be used in improvised chemical devices. Initiate the characterization of determining the effectiveness of novel delivery methods through empirical data to better understand the potential hazard and develop detection/mitigation methods for a broad range of materials delivered via those mechanisms. Establish an international/interagency burden sharing and coordination group to address emerging improvised CBR threats. Hazardous Improvised Threat Information Data Exchange (HI-TIDE) brings together the IC, TSA, Modelers, S&T and Policy community to rapidly address emerging current threats.<br>Enable U.S. Interagency Counterparts to Advance U.S. Influence and National Security Interests. Continue enhancing mitigation techniques to reduce the impact of threat releases in transportation platforms and confined spaces. Continue determination of operationally deployed detection techniques and systems could be further developed or exploited to provide additional chemical detection capabilities in a search environment. | | | | | |
| ***FY 2021 Base Plans:***<br>Enhance Survivability for Close Combat Formations. Complete development of a wearable solution that autonomously monitors, detects, and captures threat agents for identification. Complete development of a new USSI to accommodate a broader range of masks and personal protective ensembles. Initiate development of a disposable system for the rapid detection and identification of biological threats without requiring sample preparation or buffer solutions from users. Initiate development of chemical detection tape that will classify both liquids and aerosols as G series, Blister, or V series agents. Initiate improvements to a nanopore sequencing (NPS) platform to develop a fieldable system for identifying and characterizing unexpected, modified, or undiscovered biothreat agents. Initiate the development of a screening system capable of simultaneously screening passengers and bags carried by passengers for mass casualty weapons. Initiate the development of PPE seamless clothing items such as socks and gloves to avoid bulk, discomfort, and loss of tactility and dexterity.<br>Sustain CBRNE Units for Defense and the Homeland. Complete development of a risk-based decision support model for skin decontamination in the case of dermal exposures to CWAs. Complete validation methods to confirm routine decontamination of personal protection equipment is sufficient to remove emerging threats like toxins (ricin, abrin) or drugs (opioids, fentanyl analogs). Complete the development of evidence and | | | | | |

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| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| consensus-based guidance for laundry protocols and decontamination confirmation for personal protective equipment after ricin, abrin, and pharmaceutical-based agent incidents. Complete the development of a practical application of Surface Enhanced Spatially Offset Raman Spectroscopy (SESORS) for trace threat detection. Complete optimizing the methodology for using Alternative Light Sources (ALS) systems to visualize and screen for pharmaceutical-based agent (PBA) threats. Complete validating laundering techniques for work duty uniforms, bunker gear and personal protective equipment (PPE) traditionally used to remove soot, dusts, blood and other bodily fluids are sufficient for the removal of more toxic compounds such as toxins (e.g. ricin, abrin) or drugs of concern (e.g. opioids, fentanyl analogs). Complete the evaluation of the effectiveness of commercial bulk filter material for neutralizing or removing chemical gases of emerging threats from enclosed/ indoor environments. Complete improving the ability to detect and characterize chemical and biological (CB) hazards in various subterranean (Sub-T) environments. Complete collecting empirical data on the transport of aerosol particles in an urban environment to improve mathematical models used for risk assessment and hazard response. Complete the development of a containment system for rapidly encapsulating and transporting objects contaminated with chemical and biological (CB) hazards, such as chemical warfare agents (CWAs) and toxic industrial chemicals (TICs). Continue the development of a respiratory protective device designed for canines that can fit the general working dog population. Initiate development of a garment-agnostic SCBA cover to allow for simplified decontamination for SCBA external garments.<br>Integrate with the U.S. Interagency.<br>Complete development of an online database containing feedback on CBRNE detector field performance and test data. Complete the development of a system to effectively collect, aggregate, and share critical information related to biological samples and laboratory analysis results using a standard format that integrates with currently deployed responder networks. Complete updating the current open source chemical and biological recipe inventory to include metadata on each discovered recipe and incorporating recipe and precursor information into a threat recognition guide. Continue a multi-year test and evaluation program for the identification and rapid laboratory and field evaluation of emerging commercial and near-commercial explosive detection technologies to facilitate the acceleration, improvement, and fielding of promising capabilities.<br>Strengthen Alliances. Complete international laboratory round robin testing for facilities that are involved with response to biological incidents (e.g. bioterrorism, bio-crimes) in a safe no-fault environment. Continue to identify common research and development gaps and initiate projects that improve the capabilities of military and civilian first responders in handling chemical, biological and radiological events. Continue development of a man-portable system that can reliably detect explosives through continuous gas phase monitoring. Continue the investigation of the detonation of improvised radiological dispersal devices (RDDs) in an urban environment to gain valuable emergency response and forensic information. | | | | | |

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| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Support Relationships to Address Significant Terrorist Threats. Complete the systematic evaluation of gas forming reactions that could be used in improvised chemical devices. Continue the characterization of determining the effectiveness of novel delivery methods through empirical data to better understand the potential hazard and develop detection/mitigation methods for a broad range of materials delivered via those mechanisms.<br>Enable U.S. Interagency Counterparts to Advance U.S. Influence and National Security Interests. Complete determination of operationally deployed detection techniques and systems could be further developed or exploited to provide additional chemical detection capabilities in a search environment.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Decreases are reflective of the Defense Wide Review reductions. | | | | | |
| ***Title:*** IMPROVISED DEVICE DEFEAT (IDD) | 12.923 | 11.252 | 5.946 | - | 5.946 |
| ***Description:*** The IDD/EC Subgroup's objective is to deliver capabilities to defeat or neutralize the continuum of terrorist improvised weapons and explosive devices. IDD/EC improves the operational capabilities of the bomb disposal community, consisting of military EOD, and federal, state, and local bomb squads, by developing and delivering advanced tools and technologies, and decision support information to defeat improvised terrorist devices. The IDD/EC Subgroup identifies and prioritizes multi-agency end-user requirements in collaboration with military units, and federal, state, and local agencies. IDD/EC actively works with vendors and end-users to deliver advanced prototype systems that provide greater efficiency and increased safety for Bomb Technicians who investigate, access, evaluate, and if needed, render safe or dispose of suspect devices. All development efforts undertaken are in support Presidential Policy Directive 17 (PPD-17), Countering Improvised Explosive Devices, and the National Bomb Squad Commanders Advisory Board (NBSCAB) National Strategic Plan.<br><br>***FY 2020 Plans:***<br>Integrate with the U.S. Interagency. Continue development of a robot-mounted X-ray Backscatter system for VBIED diagnostics. Complete development of a 3D X-ray Imaging System to interrogate a suspected improvised explosive device (IED) and locate critical components. Complete development of a small, high definition, live-streaming camera that displays images onto a wearable screen or heads-up display. Complete development of a mixed-reality visualization system for command post/up-range support that will allow bomb technicians and support personnel to see what is transpiring downrange and assist the bomb technician with on-scene analysis. Complete development of a low cost obstruction avoidance and proximity alert system for robotic platforms. Complete development of a rapidly mountable backscatter X-ray system for small to medium sized robotic platforms. Complete development of an optimized IED jamming system that includes | | | | | |

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| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
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| updated frequencies and increased jamming power based on a pre-existing system. Complete development of a smartphone or tablet-based application that will allow bomb technicians to relay IED and IED incident information graphically to fellow bomb technicians in real-time. Continue development of a customizable energetic tools to disrupt explosive devices in high risk environments.<br>Sustain Combating Terrorism. Continue bilateral information exchange between U.S. bomb technicians and members of the Israel National Police Bomb Disposal Division. Continue conducting workshops that integrate Explosive Ordnance Disposal (EOD) and Public Safety Bomb Technicians (PSTB) with engineers and roboticists to collaboratively design and develop new capabilities for VBIED response. Continue development of bomb disposal tools for deployment on, or by, small UAS-based platforms. Continue development of an electronic, user-updatable UAS Guidebook that can be used as a quick reference guide during response operations for identification and analysis of downed UAS platforms. Discontinue development of a humanoid robotic platform for use for IED Defeat operations in urban environments due to funding constraints.. Complete conducting requirement gathering events where bomb technicians evaluate and test current technologies in a real world scenario. Complete an operational test and evaluation of Laser Scanners on several different EOD robotic platforms. Continue development of a hands-free bomb suit heads-up display that projects mission and sensor data onto the bomb suit helmet screen. Initiate development of a digital night vision system capable of producing full color images of items, reflective of their actual color to aid component identification and diagnostics. Initiate development of library of IED circuits for training, which contains component lists, assembly instructions, and files for making printed circuit boards. Initiate development of a remote chemical detection capability for EOD operations that allows identification, analysis, and technical characterization of explosives. | | | | | |
| ***FY 2021 Base Plans:***<br>Integrate with the U.S. Interagency. Complete development of bomb disposal tools for deployment on, or by, small UAS-based platforms. Complete development of an electronic, user-updatable UAS Guidebook that can be used as a quick reference guide during response operations for identification and analysis of downed UAS platforms. Continue bilateral information exchange between U.S. bomb technicians and members of the Israel National Police Bomb Disposal Division. Continue development of a digital night vision system capable of producing full color images of items, reflective of their actual color to aid component identification and diagnostics. Continue conducting workshops that integrate Explosive Ordnance Disposal (EOD) and Public Safety Bomb Technicians (PSTB) with engineers and roboticists to collaboratively design and develop new capabilities for VBIED response.<br>Sustain Combating Terrorism: Continue development of library of IED circuits for training, which contains component lists, assembly instructions, and files for making printed circuit boards. Continue development of | | | | | |

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| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| a remote chemical detection capability for EOD operations that allows identification, analysis, and technical characterization of explosives. Continue development of a hands-free bomb suit heads-up display that projects mission and sensor data onto the bomb suit helmet screen.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Decreases are reflective of the Defense Wide Review reductions. | | | | | |
| ***Title:*** INVESTIGATIVE AND FORENSICS SCIENCE<br><br>***Description:*** The IFS subgroup's objective is to advance combating terrorism capabilities in investigative and forensic science. IFS supports joint, interagency, and other partners who apply investigative and forensic science methods, means, or practices to forensic intelligence or investigations. To meet this objective, the subgroup focuses on rapid research, development, test and evaluation of new and advanced technology, equipment, forensic techniques, and investigative tools, as well as development of information resources and on support tools for risk-based decision-making and rapid exploitation of evidence. Projects emphasize rapid and field deoxyribonucleic acid (DNA) analysis, identification of insider threat within agencies, pre-blast and post-blast forensic examination, electronic evidence data acquisition and analysis, sensitive site exploitation, forensic intelligence, and criminalistics.<br><br>***FY 2020 Plans:***<br>Sustain Combating Terrorism: Complete development and fielding of DNA collection and analysis procedures usable in sensitive sites and restricted areas without leaving any trace. Complete the development and evaluation of algorithms that increase the accuracy of NCCA's Avatar and thermal imaging credibility assessment systems. Complete development of and field a vehicle image search tool with artificial intelligence that automatically trains itself to identify new makes and models of vehicles for future analysis. Continue the development of a mobile instrument with a deep UV Raman laser that visualizes undetectable latent fingerprints and makes the images immediately available for analysis. Continue the development of techniques that increase the cognitive load in persons being interviewed to obtain more information and make better credibility assessments. Continue the development of a DNA analytic process that separates out DNA in mixed samples by using microhaplotype technology. Continue the development of a microwave DNA extraction process for faster and better field preparation of DNA samples. Continue the development of and field an automatic video file search and analysis tool for any user defined object to collect evidence and intelligence. Initiate the development of forensic procedures to collect and analyze both DNA evidence and latent fingerprint evidence found on adhesive tape and related media. Initiate development of an automated system that rapidly searches large data files to detect, classify, and retrieve weapons, symbols, and other objects. Initiate development of a | 7.293 | 11.614 | 6.302 | - | 6.302 |

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| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| cross-domain digital forensics capability that utilizes smart filtering, artificial intelligence, automated multimedia analysis, and malware detection to create a comprehensive “clean” and relevant view of the exportable data and make it available to other operational networks. Initiate development of a system for audio recordings that finds and labels noises of law enforcement interest and intelligence value. Initiate development of advanced Latent Quality Metric software that standardizes and makes the latent print comparison workflow more efficient and accurate. Initiate development of an automated process to enhance the clarity, detail, and pixel level of low resolution images. Initiate development of an electro-optical handheld device that identifies persons at a distance using both infrared and visible light.<br><br>Greater Affordability at the Speed of Relevance: Complete the development and fielding of a handheld device and its accessories that documents incident scenes and collects fingerprint images and other evidence and can make comparisons at the scene with other databases. Complete development and fielding of an advanced scalable facial recognition system based on a government developed model. Complete the development and fielding of automated methods to convert foreign fingerprint files into US compatible electronic files and anonymize the source. Complete the development and fielding of a facial recognition toolkit that can quickly identify facial images at sensitive sites.<br>FY20 OCO Plans:<br>Sustain Combating Terrorism. Initiate the development of a small rugged system that automatically documents incident sites and crime scenes with images, photos, sketches, and 3-D visualizations with accurate measurements. Initiate development of a rugged, mobile, forensic alternative light source for better visualization and photographing of trace evidence.<br><br>***FY 2021 Base Plans:***<br>Sustain Combating Terrorism: Complete the development of and field an automatic video file search and analysis tool for any user defined object to collect evidence and intelligence. Complete the development of forensic procedures to collect and analyze both DNA evidence and latent fingerprint evidence found on adhesive tape and related media. Complete development of a cross-domain digital forensics capability that utilizes smart filtering, artificial intelligence, automated multimedia analysis, and malware detection to create a comprehensive “clean” and relevant view of the exportable data and make it available to other operational networks. Complete development of a system for audio recordings that finds and labels noises of law enforcement interest and intelligence value. Complete development of advanced Latent Quality Metric software that standardizes and makes the latent print comparison workflow more efficient and accurate. Complete development of an automated process to enhance the clarity, detail, and pixel level of low resolution images. Complete the development | | | | | |

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| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
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| of techniques that increases the cognitive load in persons being interviewed to obtain more information and make better credibility assessments. Complete the development of a DNA analytic process that separates out DNA in mixed samples by using microhaplotype technology. Complete the development of a microwave DNA extraction process for faster and better field preparation of DNA samples. Complete development of an electro-optical handheld device that identifies persons at a distance using both infrared and visible light. Complete the development of a small rugged system that automatically documents incident sites and crime scenes with images, photos, sketches, and 3-D visualizations with accurate measurements. Complete development of a rugged, mobile, forensic alternative light source for better visualization and photographing of trace evidence. Continue development of an automated system that rapidly searches large data files to detect, classify, and retrieve weapons, symbols, and other objects. Continue development of an automated system that rapidly searches large data files to detect, classify, and retrieve weapons, symbols, and other objects. Continue the development of and field a mobile instrument with a deep UV Raman laser that visualizes undetectable latent fingerprints and makes the images immediately available for analysis.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Decreases are reflective of the Defense Wide Review reductions. | | | | | |
| ***Title:*** Irregular Warfare and Evolving Threats (IW/ET)<br>***Description:*** The IW/ET subgroup develops new concepts and capabilities for warfighters and interagency partners. In accordance with the National Defense Strategy, projects emphasize preparation to defeat adversaries, including great powers' proxies and irregular surrogates, and succeed in a wide range of contingencies in both physical and informational domains. In order to establish and reinforce IW as a core competency, IW/ET will engage in operational assessment, concept development, and independent validation of unique prototype capabilities to identify, confront, and defeat evolving threats across the range of military operations as well as those below the threshold of conventional war.<br>***FY 2020 Plans:***<br>Expand the Competitive Space. Complete the development of a tool to support decision makers managing digital operations with some form of predictive advice as to how people will respond to a choice of different types of interventions. In this way decision making will be improved not only for planning purposes, but also for the development of capability underpinned by a behavioral science evidence base. This contributes to more effective cyber plans and ultimately operations in order to more effectively expand the competitive space. Complete a project characterizing the use of commercial technology by various actors (political actors, brands, competitors). Phase 2 will explore commercial technology identified in Phase 1 to develop at least one software prototype that | 14.953 | 9.090 | 6.158 | - | 6.158 |

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| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| enables key U.S. information programs to expand the competitive space through more precise and adaptable inform and influence programs. Complete development of a capability that can deploy, through air drop, large quantities of electronic devices that will land within a predesignated area safely. The deployment containers will draw the attention of the local populace in both the air and on the ground, will float and be watertight. This will provide Military Information Support Operations (MISO) operators the ability to deliver more complex and tailored messages to targeted populations in a safe and controllable manner, advancing the current capability of leaflet drop operations and expanding the competitive space for inform and influence effects. Complete research exploring the rapidly evolving field of Deep Fakes to evaluate its effect and evaluate options for detecting and countering adversary actions in this emerging facet of the expanded competitive space. Continue an effort to provide a capability that enables DoD, Interagency, and international users to access and leverage publicly available information, providing increased situational awareness by leveraging Artificial Intelligence (AI)/Machine Learning (ML) technologies and state-of-the-art analytic Tool Kits in order to counter a range of threats in the information environment, effectively expanding the competitive space. Continue an effort to explore the emerging blockchain technologies and the risks and opportunities posed by them with respect to United States national security interests to improve US Government understanding of the Encrypted Ledger and expand options for emerging fronts in the competitive space. Initiate project to support MISO operators by integrating cutting edge commercial technologies and applications into a toolkit that consist of advanced equipment that reflect the technology and communications infrastructure in the diverse set of environments in which MISO operates to expand the competitive space and capabilities of our partners. The toolkit shall be influence-specific, standardized and by design be interchangeable, to include capabilities that can be procured on the local economy of the country of interest. Initiate project to understand advanced multimedia developments in order to broaden the U.S. Government's options to detect and counter the emerging threat of manipulated adversarial multimedia.<br>Integrate with the U.S. Interagency. Complete transition to a new PE line an effort to manage, develop, enhance, integrate, test, deploy, and maintain a Secure, Unclassified, Network (SUNet) enterprise system that allows the user the ability to detect, monitor, understand, and act in the information environment through mission specific enclaves (partitioned mission or function information cells). This project enables unprecedented integration between DoD and the interagency for activities that help expand the competitive space while advancing U.S. influence and national security interests. Complete a plug-in for the Tactical Assault Kit (TAK) that will provide an operational Command, Control, Communications, Computers and Intelligence tool that is rapid, scalable, flexible, simple and collaborative in nature. It will run seamlessly between Android, Windows and iOS devices and will provide a secure, digital collaborative environment with planning tools that will provide | | | | | |

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| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
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| Joint, Interagency, Intergovernmental and Multinational forces the ability to operate with increased agility in the joint, dynamic, and fluid operational environment with greater integration with the U.S. Interagency.<br>Irregular Warfare as a Core Competency. Complete a study to review and evaluate existing Tactics, Techniques, and Procedures (TTP) for the integration and conduct of Operations in the Information Environment (OIE) at the tactical level of war. This effort will begin to identify requirements for OIE capabilities and integration at that level in order to identify effective TTPs for propagation across the joint force. The study will provide additional recommendations to help close identified gaps and supports the establishment of irregular warfare as a core competency.<br>Strengthen Alliances. Complete the development of a combined, joint and multi-national information sharing platform to collect and analyze photographs, videos, audio recordings, and general text-based information via precise crowd sourcing techniques. The technical approach will provide the capability to conduct facial, object and ISIL branded recognition. An Android-based application will also be available that can be customized for a specific region, language, and purpose to use for crowd-sourced media collection. The project is enhancing the ability of information programs working with allied and/or partner nations to collect, search, retrieve, view and analyze photos, audio, and video for use, thereby strengthening cooperation, alliances and expanding the competitive space to confront terrorist and other threats in the information environment. Complete efforts with the United Kingdom's Defence Science and Technology Laboratory to sponsor field research and model development to determine if the theory of conceptual transfer can be repeated and, if so, incorporated into a model to better predict how non-western people will react to outside influence. Benefits of this research will include improved understanding of how language affects cognition, thereby enabling US forces to expand the competitive space as they better understand and prevent the bias that may be introduced into collection and analysis tools, particularly in cases where vast amounts of collected data will be used to train AI.<br>Sustain Combating Terrorism. Continue a Remote Advise and Assist (RAA) project to examine conditions that would lead to successful RAA operations in a full spectrum environment and then develop and field advanced RAA prototypes in order to test the ability of advisors to continue mentoring partners remotely. By having a robust RAA capability, advisors will be able to significantly enhance time with their partners when physical access is severely restricted. By being able to advise partners in a real time operational environment, the time period needed to enhance that partner's capacity can be significantly reduced, leading to more sustainable and efficient combating terrorism operations. Observations will examine how to advance virtual communications between advisors and partners during operations, supporting crucial relationships to address significant terrorist threats at the tactical and operational levels. | | | | | |
| ***FY 2021 Base Plans:*** | | | | | |

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| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
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| .Expand the Competitive Space. Complete an effort to provide a capability that enables DoD, Interagency, and international users to access and leverage publicly available information, providing increased situational awareness by leveraging Artificial Intelligence (AI)/Machine Learning (ML) technologies and state-of-the-art analytic Tool Kits in order to counter a range of threats in the information environment, effectively expanding the competitive space. Complete an effort to explore the emerging blockchain technologies and the risks and opportunities posed by them with respect to United States national security interests to improve US Government understanding of the Encrypted Ledger and expand options for emerging fronts in the competitive space. Continue project to understand advanced multimedia developments in order to broaden the U.S. Government's options to detect and counter the emerging threat of manipulated adversarial multimedia. Initiate new efforts to develop and deploy capabilities that support DoD, interagency and foreign partners and allies who are confronting evolving threat networks and complex global operational environments.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Decreases are reflective of the Defense Wide Review reductions. | | | | | |
| ***Title:*** PERSONNEL PROTECTION<br>***Description:*** The Personnel Protection Subgroup's objective is to develop new equipment, reference tools, and standards to improve the protection of personnel. Projects focus on putting innovative tools such as automated information management systems, communication devices, tagging, tracking and locating devices, mobile surveillance systems, as well as personal and vehicle protection equipment in the hands of personnel. As indicated below, many of these developments directly support the National Defense Strategy, as well as Combating Terrorism.<br>***FY 2020 Plans:***<br>Enhance Survivability for Close Combat Formations. Complete development of a mobile sensor suite that can detect subsonic and supersonic rounds that are fired at convoy and display it on a real time map to provide situational awareness to the operator. Complete development of standalone armor plates to defeat the 7.62 X 39mm, 124 grain, mild steel core (MSC) projectile. Complete development of a robust Electromyography (EMG) sensor system comprised of electrodes, sampling electronics and processing electronics capable of integration into a robotic/human augmentation platform. Completed the development of advanced systems to detect and mitigate unmanned aerial threats using novel detection and mitigation modalities. Complete development of an updated Armored Passenger Vehicle (APV) Handbook with regards to the current management of government APV programs. Complete the investigation of the root causes of poor armor fit among U.S law enforcement agencies. Identify corrective actions and standard procedures to ensure proper fit to body armor | 19.689 | 17.165 | 7.281 | 1.363 | 8.644 |

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| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
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| users across the anthropometric spectrum of law enforcement professionals. Complete the development of a test fixture to validate the performance of non-pneumatic limb tourniquets. Continue development of biomarker identification for brain injury using magnetic resonance imaging (MRI) and magnetic resonance spectroscopy (MRS) to monitor neurochemical biomarkers for post-traumatic stress disorder and mild traumatic brain injury. Complete development of an air deployable unmanned aerial system that is capable of dashing ahead of the V-22 and providing at least 8.5 minutes of overhead intelligence, surveillance and reconnaissance (ISR) at the landing zone or drop zone prior to the force arrival. Continue development of enhanced performance personal body armor and production processes to enable successful completion of first articles tests and subsequent fielding. Continue development of a man packable system that reduces or eliminates the radar, electronic, thermal, infrared, visual or acoustic signatures of a dismounted soldier. Continue the development of a multi-modal system to detect, identify and mitigate unmanned aerial threats to tactile vehicles and other mobile platforms in terrestrial and maritime environments. Complete development of an active counter small unmanned aerial vehicle system that will employ a multi-rotor UAV to capture, retrieve and neutralize threat UAV systems. Continue the development of a vehicle mounted, tethered aerial platform capable of carrying a wide variety of payloads to fill various mission needs. Continue development of a system capable of UAS detection, geolocation, tracking and disruption for the protection of dismounted soldiers and operators.<br>Complete development and testing of injection molded ceramic armor to provide interagency vehicle with ballistic protection from advanced projectile threats.. Continue development of advanced ceramic materials with enhanced mechanical properties for use in novel armor applications. Continue development of innovative materials for use in advanced armor systems. Continue development of a two dimensional polymer material bound by robust hydrogen bonds for use in lightweight armor applications. Initiate development of a self-adhesive layer to provide ballistic protection to the extremities from blast propelled fragmentation and debris. Initiated development of a standard 7.62 x 39mm projectile test surrogate to provide a standard test round for body armor test protocols. Initiated development of a multi-threat helmet to provide impact, ballistic and blast protection for law enforcement officers.<br>Enhance Lethality for Close Combat Formations. Continue the development of a heads up display unit to be integrated into an existing helmet system and provide day and night display of data elements of interest to the operator.<br>Integrate with the U.S. Interagency. Complete development of a small lightweight wearable device that securely transmits biometric and geolocation data to a common operating picture. Continue development of a discrete, self-adhesive patch that provides silent, tactile stimulation in order to alert embassy personnel alert notifications. | | | | | |

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| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603122D8Z / *Combating Terrorism Technology Support* |

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
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| Initiate development of a 360 degree, real time sensor system to provide streaming video and anomaly detection to vehicle platforms on the move. | | | | | |
| ***FY 2021 Base Plans:***<br>Enhance Survivability for Close Combat Formations Complete development of biomarker identification for brain injury using magnetic resonance imaging (MRI) and magnetic resonance spectroscopy (MRS) to monitor neurochemical biomarkers for post-traumatic stress disorder and mild traumatic brain injury. Complete development of an air deployable unmanned aerial system that is capable of dashing ahead of the V-22 and providing at least 8.5 minutes of overhead intelligence, surveillance and reconnaissance (ISR) at the landing zone or drop zone prior to the force arrival. Complete the development of a multi-modal system to detect, identify and mitigate unmanned aerial threats to tactile vehicles and other mobile platforms in terrestrial and maritime environments. Complete development of a two dimensional polymer material bound by robust hydrogen bonds for use in lightweight armor applications. Complete development of a standard 7.62 x 39mm projectile test surrogate to provide a standard test round for body armor test protocols. Continue development of advanced ceramic materials with enhanced mechanical properties for use in novel armor applications. Continue development of innovative materials for use in advanced armor systems. Continue development of a multi-threat helmet to provide impact, ballistic and blast protection for law enforcement officers. Initiate development to increase ballistic protection and reduce weight for body armor. Initiate development of a tracking device that will work in disadvantaged/denied GPS environments.<br>Enhance Lethality for Close Combat Formations. Complete the development of a heads up display unit to be integrated into an existing helmet system and provide day and night display of data elements of interest to the operator.<br>Integrate with the U.S. Interagency. Complete development of a 360 degree, real time sensor system to provide streaming video and anomaly detection to vehicle platforms on the move. | | | | | |
| ***FY 2021 OCO Plans:***<br>Enhance Survivability for Close Combat Formations. Complete development of enhanced performance personal body armor and production processes to enable successful completion of first articles tests and subsequent fielding. Complete the development of a vehicle mounted, tethered aerial platform capable of carrying a wide variety of payloads to fill various mission needs. Complete development of a system capable of UAS detection, geolocation, tracking and disruption for the protection of dismounted soldiers and operators. Continue development of a self-adhesive layer to provide ballistic protection to the extremities from blast propelled fragmentation and debris. Continue development of a man packable system that reduces or eliminates the radar, electronic, thermal, infrared, visual or acoustic signatures of a dismounted soldier. | | | | | |

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| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
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| Integrate with the U.S. Interagency. Complete development of a discrete, self-adhesive patch that provides silent, tactile stimulation in order to alert embassy personnel alert notifications.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Decreases are reflective of the Defense Wide Review reductions. | | | | | |
| ***Title:*** PHYSICAL SECURITY<br><br>***Description:*** Rapidly develop and transition physical security/force protection capabilities and technologies to support forward deployed and domestic first responders, military, interagency, and international partners in the focus areas of Blast Effects and Mitigation; Maritime Security; Screening, Observation, Detection, and Protection; and, Subterranean Activities. Emphasize these technology development efforts primarily at U.S. embassies and consulates, forward operating bases, along the U.S. borders, at mass transportation and commerce nodes, in maritime port and littoral environments, and in support of large-scale public venues.<br><br>***FY 2020 Plans:***<br>Support Relationships to Address Significant Terrorist Threats. Complete development and false alarm rate testing of an automatic target recognition system for on the move, standoff IED detection. Continue development of a handheld anomaly detection wand to detect both non-metallic and metallic objects concealed under or in clothing to support checkpoint screening and security personnel.<br>Continue development of algorithms using machine learning for the detection of threats in Computed Tomography (CT) and x-ray screening systems. Initiate development of additional capability for Anti-Terrorism Planner (ATP) Bridge with updates for high-pressure concrete and modern cables and stays for modeling and threat assessment of bridges in the US and overseas.<br><br>Integrate with the U.S. Interagency. Complete development and testing of a small-unmanned aerial system (sUAS) to safely conduct reconnaissance of discovered illicit sites and conduct routine inspections. Complete development of reports compiling recent domestic and international terrorist events involving person-borne and vehicle-borne improvised explosive device (PBIED & VBIED) events, including location, threat, success or failure factors and overall impact. Complete development and testing of a less-than-lethal-weapon (LLW) prototype, which fires pepper projectiles with improved accuracy at extended ranges, enabling engagement of adversaries from a safer distance. Complete the development and testing of an algorithm that will automatically detect metallic and non-metallic weapons in baggage (e.g. guns and knives) and integrate the algorithm into an existing carry-on baggage x-ray system. Initiate test and evaluation of Ethylene-vinyl Acetate (EVA) laminated glass to determine its blast protection performance as compared to Polyvinyl Butyral (PVB) laminated glass. | 55.650 | 7.955 | 6.851 | - | 6.851 |

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| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603122D8Z / *Combating Terrorism Technology Support* |

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Initiate development of a relocatable tower system with additional mast height, updated surveillance and communications technologies capable of transmitting real time imagery and geolocations between Command and Control sites and field operators.<br><br>Strengthen Alliances. Complete development and testing of a fast-running ultra-high performance concrete slab model, WAC-U, and improved tools for design, protective use, and vulnerability assessments. Continue development of an advanced active diver thermal protection system for long exposure dives, including SEAL Delivery Vehicle (SDV) operations. Continue development and testing of an interoperable, detect-to-defeat capability to provide waterside security (ports and harbors) against threat divers (both open and closed circuit) and weaponized autonomous underwater vehicles (AUVs). Initiate and complete leveraging assets and capabilities to support research efforts in the area of Homemade Explosive (HME) materials characterization.<br><br>Sustain Combating Terrorism. Complete the development of a novel ship-to-shore fuel transport system with two different designs for an amphibious towable container that mitigates risk to personnel and fuel loss in the event of an attack. Complete development and testing surveillance system with automated 360 degree scanning capability (optical radar) at long ranges to protect the force in tactical combat outposts. Initiate the development of a lighter and hardened ship-to-shore fuel transport prototype to address mobility and compatibility requirements. Initiate the development of an Unmanned Underwater Vehicle (UUV) prototype, used with existing US Navy Electronic Harbor Security System (EHSS) and Coastal Riverine Expeditionary Surveillance Command Center (ESCC), for swimmer/diver and UUV interdiction.<br>***FY 2021 Base Plans:***<br>Strengthen Alliances. Initiate development of vehicle threat modeling capability for VAPO to conduct vehicle ramming and IED threat assessments on Government and sensitive facilities.<br><br>Integrate with the U.S. Interagency. Complete development and testing of a relocatable tower system with additional mast height, updated surveillance and communications technologies capable of transmitting real time imagery and geolocations between Command and Control sites and field operators. Initiate development of a commercially available access delay system for use at sensitive locations where the threat of manual attack and hostile incursions on the facility is high. Complete test and evaluation of Ethylene-vinyl Acetate (EVA) laminated glass to determine its blast protection performance as compared to Polyvinyl Butyral (PVB) laminated glass. | | | | | |

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|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603122D8Z / *Combating Terrorism Technology Support* |

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Sustain Combating Terrorism. Complete test and evaluation of an interoperable, detect-to-defeat capability to provide waterside security (ports and harbors) against threat divers (both open and closed circuit) and weaponized autonomous underwater vehicles (AUVs). Continue the development of a lighter and hardened ship-to-shore fuel transport prototype to address mobility and compatibility requirements. Complete development and testing of an advanced active diver thermal protection system for long exposure dives, including SEAL Delivery Vehicle (SDV) operations. Continue the development and testing of an Unmanned Underwater Vehicle (UUV) prototype, used with existing US Navy Electronic Harbor Security System (EHSS) and Coastal Riverine Expeditionary Surveillance Command Center (ESCC), for swimmer/diver and UUV interdiction.<br><br>Support Relationships to Address Significant Terrorist Threats. Complete development and testing of the Anti-Terrorism Planner (ATP) Bridge with updates for high-pressure concrete and modern cables and stays for modeling and threat assessment of bridges in the US and overseas. Complete development and testing of algorithms using machine learning for the detection of threats in Computed Tomography (CT) and x-ray screening systems. Complete development and testing of a handheld anomaly detection wand to detect both non-metallic and metallic objects concealed under or in clothing to support checkpoint screening and security personnel.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Decreases are reflective of the Defense Wide Review reductions. | | | | | |
| ***Title:*** SURVEILLANCE, COLLECTION AND OPERATIONS SUPPORT | 10.322 | 13.008 | 0.000 | 8.733 | 8.733 |
| ***Description:*** Identify high-priority user requirements and special technology initiatives that identify, understand, monitor and disrupt peer and near peer adversaries, state and non-state actors, who pose new and evolving threats through their development and use of emerging and disruptive technologies. Lead the development of new technologies in the areas of Signature Management, Cyber, Surveillance, Counter Surveillance, Technical Collection and Special Communications in support of Special Operations and the US Intelligence Community to advance U.S. Influence and National Security Interests and enable retaliatory or preemptive operations that reduce the capabilities and support available to peer and near peer adversaries and violent extremist or terrorist organizations as directed.<br><br>***FY 2020 Plans:***<br>Enhance Survivability for Close Combat Forces and Sustain Combating Terrorism to Advance U.S. Influence and National Security Interests: Completed development of a KA band small form factor electronically steerable array antenna system for maritime, air and ground mobile operations. Completed development of an Emergency | | | | | |

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|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603122D8Z / *Combating Terrorism Technology Support* |

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Notification and Tracking communications capability. Completed Classified Project support of Social Media based collection capability. Completed classified feasibility assessment to design and develop a new Cube Satellite Communications System. Completed classified project to develop a new Personal Electronic Device Secured Note taking application. Completed classified project to develop a Wireless Alarm Defeat Capability.<br><br>Strengthen Alliances and Sustain Combating Terrorism to Advance U.S. Influence and National Security Interests: Completed effort to develop a Hebrew Language Aptitude Battery (HILAB) Test capability. Continued development and demonstration of a low profile tactical radio system with optimized performance.<br><br>Enhance Survivability for Close Combat Forces and Sustain Combating Terrorism to Advance U.S. Influence and National Security Interests: Completed development of a new miniaturized Ultra High Frequency Band antenna or family of antennas. Completed effort to develop a Facial Recognition and Manipulation Capability for Social Media. Completed Classified Cognitive Radio effort. Continued development of a single compact, gimbaled next generation Hyperspectral Imagery (HSI) aerial sensor in both SWIR and LWIR wavebands and provide industry standard data outputs. Continued classified project to develop a specialized antenna system. Continued classified project to develop wave form identification system. Continued classified project to develop a Media Exploitation capability. Continued spiral development of the Enhanced CALYPSO RFIC and integrated transceiver devices. Initiated Classified Personal Electronic Device (PED) Detect Signature Management effort. Initiated Classified Surveillance and Signature Management effort to develop a low observable High Definition (HD) and Audio Visual (AV) system. Initiated Classified Neural Net Special Communications effort. Initiated Classified Field Processing Technical Collection effort. Initiated Classified Alternative Waveform Special Communications effort. Initiated Classified Data Obscuration Special Communications effort. Initiated Classified Integrated Air Defense Geo-Location Technical Collection effort.<br>.<br>***FY 2021 Base Plans:***<br>N/A<br>***FY 2021 OCO Plans:***<br>Strengthen Alliances and Sustain Combating Terrorism to Advance U.S. Influence and National Security Interests: Complete development and demonstration of a low profile tactical radio system with optimized performance. | | | | | |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603122D8Z / *Combating Terrorism Technology Support* |

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Enhance Survivability for Close Combat Forces and Sustain Combating Terrorism to Advance U.S. Influence and National Security Interests: Complete classified project to develop a specialized antenna system. Complete classified project to develop wave form identification system. Complete Classified Neural Net Special Communications effort. Complete Classified Field Processing Technical Collection effort. Complete Classified Alternative Waveform Special Communications effort. Complete Classified Data Obscuration Special Communications effort. Complete development of a single compact, gimbaled next generation Hyperspectral Imagery (HSI) aerial sensor in both SWIR and LWIR wavebands and provide industry standard data outputs. Complete classified project to develop a Media Exploitation capability. Complete spiral development of the Enhanced CALYPSO RFIC and integrated transceiver devices. Complete Classified PED Detect Signature Management effort. Complete Classified Surveillance and Signature Management effort to develop a low observable HD AV system. Continue Classified Integrated Air Defense Geo-Location Technical Collection effort. Initiate deployment of field technical surveillance capabilities against peer/ near peer adversaries and terrorist threats through development or enhancement of Multi-intelligence collection systems, customized tagging, tracking and locating capabilities. Initiate the development of non-standard and specialized communications capabilities to support retaliatory or preemptive operations against highly technical adversaries. Initiate development of signature management capabilities and new techniques that protect the force and support the collection and targeting process.<br><br>Expand the Competitive Space, Enhance Survivability for Close Combat Forces and Sustain Combating Terrorism to Advance U.S. Influence and National Security Interests: Initiate development of enhanced capabilities against vehicular signals of interest and Cyber Convergent Technologies.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Decreases are reflective of the Defense Wide Review reductions. | | | | | |
| ***Title:*** TACTICAL OPERATIONS SUPPORT | 25.374 | 21.058 | 0.000 | 9.192 | 9.192 |
| ***Description:*** The Tactical Operations Support subgroup's mission is to execute rapid research and development projects that enhance capabilities of DoD and Interagency special operations tactical teams engaged in finding, fixing, and finishing terrorists. This includes support to state and local law enforcement agencies to combat domestic terrorism. The development focus is enabling small tactical units by providing state of the art overmatch capabilities in: Offensive Systems; Unconventional Warfare, Counter-Insurgency Support; Tactical Communications; Tactical Reconnaissance, Surveillance, and Target Acquisition Systems; Specialized Infiltration, Access and Exfiltration Systems; and Survivability Systems. | | | | | |

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| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603122D8Z / *Combating Terrorism Technology Support* |

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| ***FY 2020 Plans:***<br>Enhance Lethality for close combat formations. Complete spiral development of integration of small unmanned aircraft system stabilized gimbal that integrates laser target designation technologies onto current program of record airframes. Complete spiral development of a next generation Lightweight Medium Machine Gun (LWMMG) and polymer .338 Norma Magnum ammunition to give Special Operations Forces a distinct advantage in both the extended and close-in fight and be able to transition rapidly from mounted operations to dismounted operations. Complete development of an accurized 120mm mortar system with an advanced targeting system for installation and employment on a 5-ton Medium Tactical Vehicle (MTV) capable of lethal target engagement from a short halt out to 7 kilometers. Complete testing and optimization of barrel length, rifling twist rate, and suppression of the .300 Blackout rifle platform in conjunction with an underwater supercavitating ammunition. Complete development of a compact, wide exit pupil direct view optic for use on lightweight medium machine guns to effectively engage targets at the maximum effective range of the weapon system. Complete development of lightweight ammunition packaging to replace the standard M2A1 ammunition for use in logistical re-supply by conventional and Special Operations Forces. Complete test and evaluation of a commercially available cluster munition to determine its efficacy in reducing the dud rate to less than one percent. Complete development of a vertical take-off and landing loitering munition for engagement of targets in urban areas and defilade for Special Operations Forces. Complete development of a clip-on in-line mid-wave infrared thermal sight for use on lightweight medium machine guns, sniper rifles, and for counter-UAS missions. Complete development of a new ballistic algorithm, projectile drag coefficient, and weapons system for lethal target engagement beyond current extreme distances. Continue test and evaluation of a stabilized weapon mount for employment on ground vehicles, airframes, and maritime platforms. Continue development of a family of intermediate caliber weapon systems, including ammunition, for use in close quarters combat, designated marksmen, and individual weapon system roles. Continue spiral development of integration of small unmanned aircraft system stabilized gimbal that integrates laser target designation technologies onto current program of record airframes. Continue development of a small unmanned aerial system gunship with a modular kinetic payload for lethal engagements. Initiate development of a low-cost tactical sUAS that complies with current DoD cyber hardening policy. Initiate development of a low-cost vertical takeoff and landing (VTOL) loitering munition capable of being transported and launched by a single operator and controlled using a small laptop/tablet or wearable device. Initiate development of a dual channel medium range weapon sight with the ability to overlay near infrared and long wave infrared sensor images within one device. Initiate development of highly accurate ammunition for next generation sniper systems. Initiate development of a window breaching kit for snipers that enables a single operator to remove glass obstructions prior to shooting. Initiate development of a remotely- | | | | | |

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| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603122D8Z / *Combating Terrorism Technology Support* |

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|

operated integrated lighting system for canines that is operated based on mission activities. Initiate development of an electronic warfare kit optimized for use in subterranean and complex urban terrain. Initiate development of an advanced weapon sight capable of ranging, tracking, and providing real-time ballistic shooting solutions for individual weapon systems. Initiate development of a system to enhance combatant craft in terms of additional payloads, environmental protection and signature management, providing additional tactical mobility options to Combatant Commanders.

Enhance Survivability for close combat formations. Complete development of an Air to Surface Employment Kit (A2SEEK), for the already developed Micro Weather Sensor (MWS), to be packaged into a complete system that will be air dropped out of military aircraft to support operators and C2 elements to receive sensed weather elements and formulate aviation reports in deep battlespace or denied areas. Complete development and testing of a thermal camouflage material for soldier uniforms, vehicles, and hide sites. Complete spiral development to improve form factor, interoperability, and battery life of a state-of-the-art amplified transceiver speaker unit to work with a number of military and commercial radio devices. Complete development of a wide field of view binocular night vision device. Continue development of a man-portable (dismounted/static), on-the-move (vehicle mounted), and kinetic kill anti-drone system kit that is capable of detection, tracking, identification, and defeating a small Unmanned Aircraft System (sUAS).

***FY 2021 Base Plans:***

N/A

***FY 2021 OCO Plans:***

Enhance Lethality for close combat formations. Complete development of a man-portable (dismounted/static), on-the-move (vehicle mounted), and kinetic kill anti-drone system kit that is capable of detection, tracking, identification, and defeating a small Unmanned Aircraft System (sUAS). Complete test and evaluation of a stabilized weapon mount for employment on ground vehicles, airframes, and maritime platforms. Complete spiral development of integration of small unmanned aircraft system stabilized gimbal that integrates laser target designation technologies onto current program of record airframes. Complete development of a window breaching kit for snipers that enables a single operator to remove glass obstructions prior to shooting. Complete development of a small unmanned aerial system gunship with a modular kinetic payload for lethal engagements. Complete development of a dual channel medium range weapon sight with the ability to overlay near infrared and long wave infrared sensor images within one device. Complete development of a family of intermediate caliber weapon systems, including ammunition, for use in close quarters combat, designated marksmen, and individual weapon system roles. Complete development of a remotely-operated integrated lighting system for canines that is operated based on mission activities. Continue development of a low-cost vertical takeoff

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| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603122D8Z / *Combating Terrorism Technology Support* |

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| and landing (VTOL) loitering munition capable of being transported and launched by a single operator and controlled using a small laptop/tablet or wearable device. Continue development of a low-cost tactical sUAS that complies with current DoD cyber hardening policy. Continue development of highly accurate ammunition for next generation sniper systems. Continue development of an electronic warfare kit optimized for use in subterranean and complex urban terrain. Continue development of an advanced weapon sight capable of ranging, tracking, and providing real-time ballistic shooting solutions for individual weapon systems. Continue development of a system to enhance combatant craft in terms of additional payloads, environmental protection and signature management, providing additional tactical mobility options to Combatant Commanders.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Decreases are reflective of the Defense Wide Review reductions. | | | | | |
| ***Title:*** TRAINING TECHNOLOGY DEVELOPMENT | 5.934 | 8.058 | 5.481 | - | 5.481 |
| ***Description:*** The TTD Subgroup's objective is to provide SOF, DoD, and the interagency with agile, rapid response, R&D capabilities for optimizing performance in the operational environment and increasing readiness for tomorrow's threats. To meet this objective, the subgroup develops human-centered technologies that are performance outcome focused in the areas of immersive learning technology, human performance tools and techniques, and innovative training and educational concepts. TTD's capabilities contribute to building a more lethal force and prepare personnel for critical missions that identify, disrupt, and defeat threats in any operational environment.<br><br>***FY 2020 Plans:***<br>Build a More Lethal Force: Complete the development and evaluation of a synthetic intelligence, surveillance, and reconnaissance (ISR) system to train Full Motion Video (FMV) ISR operational knowledge, skills, and abilities without incurring the costs of utilizing live ISR platforms. Complete the enhancement of an existing human performance application to incorporate the recording and analysis of mental performance indicators such as stress, motivation, and fatigue thereby providing a common language for instructors, psychologists, and human performance coaches to understand and make decisions about training. Continue the development and evaluation of a synthetic Internet sandbox to enable intelligence analysts and information operations personnel to train on analytical tools and to tactics, techniques, and procedures used for the collection, analysis, and exploitation of adversary online information. This sandbox will incorporate the effects of online information into large-scale exercises, while mitigating the challenges and risks associated with training on the open, publicly visible Internet. Initiate the development of an interactive and dynamic Full Motion Video (FMV) Processing | | | | | |

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| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603122D8Z / *Combating Terrorism Technology Support* |

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Exploitation, and Dissemination (PED) desktop training simulator and program of instruction that trains SOF analysts to SOF-specific FMV PED tactics, techniques, and procedures; methodologies; and product standards.<br>Enhance Lethality for Close Combat Formations: Complete the development of an intelligent tutoring system that will instruct Soldiers in how to integrate and interpret operations, intelligence, and civil information within the Common Operating Picture for enhanced situational awareness and reduced cognitive workload.<br>Sustain CBRNE Units for Defense and the Homeland: Complete the development of a virtual reality (VR) based training system for Public Safety Bomb Technicians and Military Explosive Ordnance Disposal forward teams to practice sensitive site exploitation skills with realistic lab equipment in simulated field and lab settings. Initiate the development of photorealistic immersive training environments to replicate high-risk scenarios and standardize curriculum for Explosive Ordnance Disposal technicians and other operators.<br>Sustain Combating Terrorism: Continue the development of an immersive mixed reality (MR) simulator for training specific emergency procedures (EPs) for the MK-16 self-contained diving rig often used for Mine Countermeasures operations. Initiate the development of an AC-130J Virtual Reality Combat Mission Trainer to enable operational crews to engage in mission tasks within a simulated environment that replicates sensory information of real-world mission performance found in joint mission essential task (JMET) environments.<br>Strengthen Alliances and Attract New Partners: Continue the development of a multi-sensory (e.g., visual, auditory, tactile) immersive tactical decision making training simulator that features realistic character representation, reaction, and interaction through natural language processing in response to force application.<br>Expand the Competitive Space: Complete the development and delivery of a virtual reality simulated city environment for United States Department of Defense, Department of State, and Department of Homeland Security as well as international partners to train skillsets such as surveillance and emergency response by immersing students into realistic training scenarios with representative quantities and behaviors of non-player characters. | | | | | |
| ***FY 2021 Base Plans:***<br>Build a More Lethal Force: Complete the development and evaluation of a synthetic Internet sandbox to enable intelligence analysts and information operations personnel to train on analytical tools and to tactics, techniques, and procedures used for the collection, analysis, and exploitation of adversary online information. This sandbox will incorporate the effects of online information into large-scale exercises, while mitigating the challenges and risks associated with training on the open, publicly visible Internet. Initiate the development of innovative training and education for cyber defense, resilience, and the continued integration of cyber capabilities into the full spectrum of military operations. | | | | | |

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| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603122D8Z / *Combating Terrorism Technology Support* |

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Sustain CBRNE Units for Defense and the Homeland: Complete the development of photorealistic immersive training environments to replicate high-risk scenarios and standardize curriculum for Explosive Ordnance Disposal technicians and other operators.<br>Sustain Combating Terrorism: Complete the development of an immersive mixed reality (MR) simulator for training specific emergency procedures (EPs) for the MK-16 self-contained diving rig often used for Mine Countermeasures operations.<br>Expand the Competitive Space: Complete the development of a multi-sensory (e.g. visual, auditory, tactile) immersive tactical decision making training simulator that features realistic character representation, reaction, and interaction through natural language processing in response to force application.<br>Build a More Lethal Force: Complete the development of an interactive and dynamic Full Motion Video (FMV) Processing Exploitation, and Dissemination (PED) desktop training simulator and program of instruction that trains SOF analysts to SOF-specific FMV PED tactics, techniques, and procedures; methodologies; and product standards.<br>Sustain Combating Terrorism: Complete the development of an AC-130J Virtual Reality Combat Mission Trainer to enable operational crews to engage in mission tasks within a simulated environment that replicates sensory information of real-world mission performance found in joint mission essential task (JMET) environments.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Decreases are reflective of the Defense Wide Review reductions. | | | | | |
| **Accomplishments/Planned Programs Subtotals** | 168.012 | 116.747 | 51.089 | 19.288 | 70.377 |

**D. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

N/A

**E. Acquisition Strategy**

N/A

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| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603133D8Z / *Foreign Comparative Testing* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 86.215 | 23.867 | 24.970 | 25.183 | - | 25.183 | 25.784 | 26.243 | 26.919 | 27.466 | Continuing | Continuing |
| 313: *Foreign Comparative Testing* | 86.215 | 23.867 | 24.970 | 25.183 | - | 25.183 | 25.784 | 26.243 | 26.919 | 27.466 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

The Foreign Comparative Testing (FCT) Program increases Joint Force readiness and lethality by providing near-term solutions to existing and future Department of Defense (DoD) capability gaps by leveraging the Research & Development (R&D) investments of allied nations and coalition partners. The FCT Program Element (PE) evaluates prototypes derived from allied and partner nation technologies to provide the U.S. Armed Services, U.S. Special Operations Command (USSOCOM), and Defense agencies capabilities to counter emerging threats. FCT's broad reach across our allies and friendly foreign countries enables development of innovative, cost effective, and interoperable solutions to meet needs communicated by the Joint Chiefs of Staff and the Combatant Commanders. Military Services and USSOCOM jointly conduct FCT projects. FCT strengthens alliances by facilitating international collaboration and evaluating technologies that increase interoperability while serving as a catalyst for teaming and other business relationships between international and domestic industries. Partner nations recognize the long-term value of the "two-way street" for Defense procurements for which FCT provides an avenue. Numerous successful projects have resulted in the licensed production of a qualified foreign item in the United States, including the creation of jobs and contributions to local economies. To date, companies from 34 states have benefited from FCT projects. FCT supports DoD best practices by incentivizing the use of prototyping and experimentation in advancing technological solutions to warfighter problems and acts as a hedge against threat developments. FCT enhances affordability by reducing development costs and risk, accelerating acquisition timelines, and increasing competition. Through increasing Joint lethality and readiness, strengthening alliances, and delivering affordable performance on accelerated timelines, FCT supports all three lines of effort outlined in the National Defense Strategy. Authorized by Title 10, U.S. Code, Section 2350a (g), the FCT program is managed by the Office of the Under Secretary of Defense for Research and Engineering (OUSD R&E), Comparative Technology Office (CTO).

Measurable Outcomes:
-FCT projects will demonstrate capability objectives within 12-36 months.
-Over its 40-year history, FCT has a transition rate of 58 percent (357 out of 612) for completed projects. Of the 357 projects that tested successful, 280 or 78 percent resulted in follow on procurements of over $11.000 billion.

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| **B. Program Change Summary ($ in Millions)** | **FY 2019** | **FY 2020** | **FY 2021 Base** | **FY 2021 OCO** | **FY 2021 Total** |
| Previous President's Budget | 24.277 | 24.970 | 25.416 | - | 25.416 |
| Current President's Budget | 23.867 | 24.970 | 25.183 | - | 25.183 |
| Total Adjustments | -0.410 | 0.000 | -0.233 | - | -0.233 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | 0.000 | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | -0.406 | - | | | |
| • Other Program Adjustments and DoD Priorities | -0.004 | - | -0.208 | - | -0.208 |
| • Economic Assumption | - | - | -0.025 | - | -0.025 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 3 | R-1 Program Element (Number/Name)<br>PE 0603133D8Z / *Foreign Comparative Testing* | Project (Number/Name)<br>313 / *Foreign Comparative Testing* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 313: *Foreign Comparative Testing* | 86.215 | 23.867 | 24.970 | 25.183 | - | 25.183 | 25.784 | 26.243 | 26.919 | 27.466 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

The FCT Program Element funding supports projects that test and evaluate innovative technologies already developed by partner nations and in doing so, directly aligns to the National Defense Strategy lines of effort: increasing Joint lethality in contested environments, strengthening partnerships, and fostering reform through delivery of capability at the speed of relevance. Individual projects typically average less than $1.200 million each and complete within 12-36 months. Projects are proposed by the Military Services and USSOCOM and are selected using a merit-based process that identifies the most promising, innovative, and cost-effective solutions to validated warfighter requirements, with an emphasis on transitioning technologies into current or future programs of record. Projects are selected based on potential to yield cost, schedule, or performance improvements over the status quo.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** High Power Radio Frequency (HPRF) for Counter Unmanned Aerial Systems (CUAS) (Navy/USMC)<br>***Description:*** This project integrates and tests HPRF directed energy source components with various off-the-shelf sensor technologies to provide a complete CUAS prototype system that provides the capability to detect, track, identify, engage, and defeat low and slow UAS. This project looks to enhance DoD capabilities in the Directed Energy focus area. Test articles received and acceptance testing occurred in FY 2019. System performance testing continues throughout FY 2020 with FY 2019 funds. Program Manager (PM) will make a transition decision and close-out report will be completed in 4Q FY 2020. If successful, this technology will be available as a quick reaction capability and will be available for transition to Ground Based Air Defense program offices to support CUAS operations. | 0.887 | - | - |
| ***Title:*** Hybrid Vertical Take-off and Landing (VTOL)/Fixed Wing UAS (Navy)<br>***Description:*** This project comparatively tests off-the-shelf hybrid UAS capable of vertical takeoff and landing as well as fixed wing flight for increased endurance and range over existing UAS in the Navy inventory. Hybrid UAS do not require a runway or launch and recovery equipment and thus may be better suited for shipboard operations. Test articles received, bench testing completed, and comparative testing initiated in FY 2019. Comparative testing continues throughout FY 2020 with FY 2019 funds. PM will make a transition decision and close-out report will be completed in 4Q FY 2020. | 0.610 | - | - |
| ***Title:*** Special Operations Force (SOF) Precision Strike System (United States Special Operations Command (USSOCOM))<br>***Description:*** This project evaluates a loitering munition for close air support in denied environments. This will provide SOF with an organic precision strike capability in areas where close air support may not be available. If successful, this technology will be available for immediate fielding to Special Operations Forces Component Commanders as well as transition to USSOCOM for | 0.500 | - | - |

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| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| acquisition. Acceptance testing completed in 2Q FY 2019. Live-fire testing will occur in 2Q FY 2020 with FY 2019 funds. PM will make a transition decision and close-out report will be completed in 3Q FY 2020. | | | |
| ***Title:*** More Reliable, Longer Endurance, More Power Unmanned Aerial Systems (UAS) (Army)<br>***Description:*** This project comparatively tests the performance of the Danielson Trident 100TD2 engine versus the existing MQ-5B Hunter engine. The Trident 100TD2 is a candidate engine for use in next generation UAS and new production of existing UAS for foreign military sales because of its improved reliability, increased power, and reduced life cycle costs. If successful, the Army will pursue flight demonstration prior to insertion into the Army's UAS program of record for fielding on MQ-5B Hunter. This project completed legacy baseline testing in FY 2019. Performance testing continues throughout FY 2020 with FY 2019 funds. PM will make a transition decision and close-out report will be completed in 2Q FY 2020. | 0.405 | - | - |
| ***Title:*** Pilot Physiology Based Autonomous Life Support System (Air Force)<br>***Description:*** This project will integrate and test a Pilot Physiological Monitoring and Warning System (PPMAWS) with a new digital breathing regulator that incorporates machine learning to autonomously control the flow of oxygen to military aircraft. This project will also evaluate an off-the-shelf Pilot Breath Monitoring System (PBAM) currently in use with the Finnish Air Force, which requires no aircraft modification. These technologies could assist in preventing in-flight hypoxia, hypocapnia, and hyperoxia events currently experienced by pilots, improving flight safety, and aircraft availability. This project supports DoD's Artificial Intelligence/Machine Learning (AI/ML) focus area. If successful, the PBAM will be available for immediate fielding and the PPMAWS will transition to follow-on flight testing which is beyond the scope of this project. Test articles received, integrated into a flight helmet, and bench testing completed in 2Q FY 2019. Performance testing occurs throughout FY 2020 with FY 2019 funds. PM will make a transition decision and close-out report will be completed in 4Q FY 2020. | 0.550 | - | - |
| ***Title:*** Three Dimensional (3D) Mapping at the Edge (USSOCOM)<br>***Description:*** Leverages state of the art AI techniques to extract 3D surface models from multiple source data and load products onto forward deployed handheld devices in real-time. This project delivers advanced capability for the management, production, and dissemination of geospatial mission data, including 3D elevation data, in an open standards-based format that supports operations in dismounted and/or disconnected environments using mobile devices. This project supports the AI/ML focus area. Data integration and testing of delivery to mobile devices occurred in 2Q-4Q FY 2019. Streaming 3D tactical user workshop occurred in 4Q FY 2019. This project continues in FY 2020 with FY 2019 funds. The PM will demonstrate the technology during a joint exercise in FY 2020 to highlight a new national capability for interoperable 3D Geospatial Intelligence Products. PM will make a transition decision and close-out report will be completed in 1Q FY 2020. If successful, this technology will transition to the National Geospatial Intelligence Agency program of record for fielding across the Department of Defense. | 0.229 | - | - |

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| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Rifle Accessory Control Unit (Navy)<br><br>***Description:*** This project tests a rifle-mounted device capable of controlling various weapon accessories or radios. This device enables Marines to maintain situational awareness without taking their hand off the weapon. Laboratory and squad usability testing was conducted in FY 2019. Platoon usability testing and advanced capability maturation will occur in FY 2020 with FY 2019 funds. PM will make a transition decision and close-out report will be completed in 4 Q FY 2020. If successful, this technology will be transitioned to U.S. Marine Corps Program Manager for Marine Expeditionary Rifle Squad for follow on procurement and fielding. | 1.326 | - | - |
| ***Title:*** Future X-Band Radar (Navy)<br><br>***Description:*** Tests an off-the-shelf open-architecture Active Electronically Scanned Array (AESA) X-band aircraft radar for potential application to the Navy's Air and Missile Defense Radar (AMDR) program for ships. Currently, AMDR lacks a modern AESA X-band component to provide horizon surveillance against current and future threats. PM completed test planning and contracting for acquisition in FY 2019.<br><br>***FY 2020 Plans:***<br>PM receive final test articles and laboratory testing will commence in 2Q FY 2020. This project will continue in FY 2021 with FY 2020 funding. If successful, the US Navy plans to award an X-band Radar program to develop and produce an advanced sensor for employment in DDG Flight III and other surface combatants.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding decreases in FY 2021 as test completes and project is closed out. | 0.500 | 1.000 | - |
| ***Title:*** Long-Range Tactical Intelligence Surveillance and Reconnaissance (ISR) Targeting, and Strike System (Navy/USMC)<br><br>***Description:*** This project evaluates the capabilities of a fully autonomous, recoverable, remotely operated, electro-optical, precision-guided loitering munition, which can conduct ISR as well as locate and engage enemy targets. This provides Marine Corps commanders with a responsive strike capability to increase operational flexibility and shorten engagement timelines. If successful, initial transition would consist of a limited procurement with user evaluation by operational units prior to fielding with Ground Combat Elements. Test planning and test article contract award occurred in FY 2019. This project continues in FY 2020 with FY 2020 funds.<br><br>***FY 2020 Plans:***<br>Project will complete Live Fire testing and assessment in 3Q FY 2020. PM will make a transition decision and close-out report will be completed in 4Q FY 2020.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:*** | 0.649 | 0.800 | - |

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| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Funds decrease from FY 2020 to FY 2021 as major test events complete and project is closed out. | | | |
| ***Title:*** Low Profile Satellite Communications (SATCOM) on the Move Antenna (Navy/USMC)<br><br>***Description:*** This project tests a low-profile dual-band (Ku/Ka) antenna with high tracking accuracy for vehicles to enable SATCOM on the move in rough terrain. This reduces the potential of adversaries targeting high value command and control vehicles while increasing operational utility. If successful, the technology will transition to Marine Corps Networks on the Move program of record. PM received test articles and acceptance testing initiated in FY 2019. Testing continues in FY 2020 with FY 2020 funds.<br><br>***FY 2020 Plans:***<br>System performance testing initiated in FY 2019 and will continue in FY 2020. PM will make a transition decision and close-out report will be completed in 4Q FY 2020.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funds decrease from FY 2020 to FY 2021 as final testing is completed and project is closed out. | 0.498 | 0.236 | - |
| ***Title:*** Event-Based Sensing for Space & Directed Energy Applications (Air Force)<br><br>***Description:*** This project comparatively tests neuromorphic imaging technology and algorithms. This technology enhances daytime ground, space-based situational awareness and directed energy test and evaluation. The resulting prototype if successful will enhance ground-based space situational awareness and the technology will be inserted into further space-based situational awareness technology development. Test articles procured and received in 3Q FY 2019. Integration and initial testing commenced in 4Q FY 2019. This project continues in FY 2020 with FY 2020 funds.<br><br>***FY 2020 Plans:***<br>Application-specific testing will occur throughout FY 2020. PM will make a transition decision and close-out report will be completed in 4Q FY 2020.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding decreases in FY 2021 due to project completion. | 0.500 | 0.456 | - |
| ***Title:*** Improved Amphibious Track (Navy)<br><br>***Description:*** Comparatively tests composite rubber track systems for Marine Corps and Army vehicles. This technology reduces weight, improves fuel economy and operational reach, reduces maintenance costs, and increases mobility. If successful, the best product will transition to Program Manager - Advanced Amphibious Assault and may transition to other tracked vehicles. | 0.800 | 1.600 | - |

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| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Test planning and test article contract award occurred in 1-2Q FY 2019. Initial test articles received in 4Q FY 2019. This project continues in FY 2020 with FY 2020 funds.<br><br>***FY 2020 Plans:***<br>Laboratory testing will occur 1Q FY 2020. Noise and obstacle testing will occur in 2Q FY 2020. Durability testing will occur in 3Q FY 2020. The project is expected to complete and PM will make a transition decision and close-out report will be completed in 4Q FY 2020.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding decreases in FY 2021 due to project completion. | | | |
| ***Title:*** Synthetic Aperture Sonar for Mine Countermeasures Unmanned Underwater Vehicles (UUVs) (Navy)<br><br>***Description:*** This project tests a Synthetic Aperture Sonar payload with on-board automatic target recognition algorithms for Mine Countermeasure UUVs to increase detection range and resolution. This technology reduces the time required for mine countermeasure missions and post mission analysis. If successful, the technology will transition to Program Manager Naval Explosive Ordnance Disposal for inclusion on the Mk 18 UUV. Test planning and test article contract award occurred in 1Q-2Q FY 2019. Demonstration of real-time processing on small UUV in 3Q FY 2019. Test articles received in 4Q FY 2019. This project continues in FY 2020 with FY 2020 funds.<br><br>***FY 2020 Plans:***<br>Engineering trials will take place throughout FY 2020. PM will make a transition decision and close-out report will be completed in 4Q FY 2020.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funds decrease from FY 2020 to FY 2021 as final testing is completed. | 0.771 | 0.309 | - |
| ***Title:*** Multi-Mission Weaponized Soldier - Unmanned Aerial System (Army)<br><br>***Description:*** This project evaluates an Unmanned Aerial System (UAS) in a 40-millimeter grenade form factor with a modular payload. The system is operated by an individual soldier, has a range of up to 12 kilometers, and can fly for up to 12 minutes. This technology provides non-lethal situational awareness and lethal indirect fire support against enemies in defilade or behind walls. This project initiated test planning and contract preparation in 4Q FY 2019 and continues in FY 2020 with FY 2020 funds.<br><br>***FY 2020 Plans:*** | 0.030 | 0.605 | 0.885 |

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| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Acquisition of test articles will occur in 1Q FY 2020. Phase I weapon system integration testing will occur in 2Q-3Q FY 2020. Phase II baseline performance assessment will occur in 4Q FY 2020. This project will continue in FY 2021 with FY 2021 funds.<br>***FY 2021 Plans:***<br>Integration of Government-off-the-shelf payloads will occur in 1Q FY 2021. Phase III performance testing with Government payloads will occur in 2Q FY 2021. Phase IV advanced capabilities assessment and experimentation will occur in 3Q FY 2021. A transition decision and close-out will be completed in 4Q FY 2021. If successful, this technology will transition to the Joint Munitions & Lethality Life Cycle Management Command for follow on operational evaluations.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funds increase from FY 2020 to FY 2021 to support major test events. | | | |
| ***Title:*** Anti-Submarine Warfare Sensor Capabilities onboard Unmanned Surface Vehicles (Navy)<br>***Description:*** This project tests a compact towed variable depth sonar system for Navy Unmanned Surface Vehicles. System provides an autonomous anti-submarine warfare (ASW) detection capability aboard unmanned surface vessels to fill area coverage gaps when manned ASW vessels are unavailable. Test planning and contract preparation occurred in 4Q FY 2019.<br>***FY 2020 Plans:***<br>Loaned test article will be received in 1Q FY 2020. Test article installation and integration will commence in 2Q FY 2020. Integration testing will occur in 3Q FY 2020. The system will be demonstrated at RIMPAC 2020 during 4Q FY 2020.<br>***FY 2021 Plans:***<br>A transition decision and close-out will be completed in 2Q FY 2021. If successful, this technology will be available for transition to the Navy's Unmanned Maritime Systems Program Office for follow on acquisition and fielding.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funds decrease in FY 2021 as testing is completed and project closed out. | 0.050 | 0.750 | 0.300 |
| ***Title:*** Hostile Fire & Pre-Shot Detection for Vehicle Protection Systems (Army)<br>***Description:*** This project comparatively tests technologies to autonomously detect and locate incoming hostile fire as well as potential threats before a shot is fired. These technologies will increase situational awareness and reduce response times leading to increased lethality and survivability for ground forces, especially in urban environments. If successful, this technology will transition to the Army's Program Manager for Vehicle Protection Systems for initial fielding in 2022. Systems received and initial testing, bench testing and safety certification of components occurred in 2Q-4Q FY 2019. This project continues in FY 2020 with FY 2020 funds.<br>***FY 2020 Plans:*** | 1.200 | 0.900 | 0.465 |

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| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Pre-shot detection systems will be demonstrated in 1Q FY 2020. Additional characterization testing will occur in 3Q FY 2020. Field testing and demonstrations are planned for 3Q-4Q FY 2020. This project continues in FY 2021 with FY 2021 funds.<br>***FY 2021 Plans:***<br>A vehicle Rodeo to test the Vehicle Protection Systems is planned for 1Q-3Q FY 2021 with follow on vehicle integration testing in 4Q FY 2021. Final test and closeout reports will be completed in 4Q FY 2021.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funds decrease in FY 2021 with conclusion of major test events and project completion. | | | |
| ***Title:*** Dual Protocol Network Interface Card (Air Force)<br>***Description:*** This project evaluates a network interface card that supports both low-speed legacy Military Standard 1553B and high-speed North Atlantic Treaty Organization (NATO) Standardization Agreement (STANAG) 7221 protocols. This provides an affordable upgrade path to high-speed 100 Mbps data throughput for aircraft networks enabling weapons systems to perform at desired warfighting capability levels. If successful, this technology will transition to the Air Force Program Executive Office Fighter/ Bombers for follow on procurement and fielding on military aircraft. This project was initiated out-of-cycle in 4Q FY 2019. Initial test planning and contract preparation occurred in 4Q FY 2019. This project continues in FY 2020 with FY 2020 funds.<br>***FY 2020 Plans:***<br>Obtain interim authority to test, complete information assurance assessment, and conduct safety reviews from 1-2Q FY 2020. Initial performance testing will be conducted on a representative avionics data bus in a laboratory environment in 3Q FY 2020. Upon successful completion, a pre-flight test safety assessment will be performed prior to integration and test on a B-52 bomber and KC-135 tanker in 4Q FY 2020. This project continues in FY 2021 with FY 2021 funds.<br>***FY 2021 Plans:***<br>Flight demonstrations will be conducted in 1-3Q FY 2021. A final ground demonstration of the ability for STANAG 7221 to sufficiently isolate two channels of data will occur in 4Q FY 2021. Final test and closeout reports will be completed by end of 4Q FY 2021.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding decreases from FY 2021 to FY 2022 as final testing is completed and project is closed. | 0.050 | 0.674 | 0.297 |
| ***Title:*** Active Expendable Decoys (Air Force)<br>***Description:*** This project evaluates expendable Digital Radio Frequency Memory countermeasures for use on 4th Generation Fighter aircraft. This technology provides increased protection against modern air-to-air and surface-to-air radio frequency guided | 1.000 | 2.000 | 1.000 |

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| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| missiles. If successful, the technology will transition to F-15, F-16, and F-18 electronic warfare programs for procurement. Test planning and contract preparation occurred in 2Q-4Q FY 2019. This project continues in FY 2020 with FY 2020 funds.<br><br>***FY 2020 Plans:***<br>Laboratory testing of expendables to occur in 1Q FY 2020. Dispenser integration and testing to occur in 2Q FY 2020. Platform-specific testing to include integrated avionics will be conducted in 3Q-4Q FY 2020. This project continues in FY 2021 with FY 2021 funds.<br><br>***FY 2021 Plans:***<br>Flight testing will occur 1Q FY 2021, culminating with a bilateral demonstration in 3Q FY 2021. PM will make a transition decision and close-out report will be completed in 4Q FY 2021.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding decreases in FY 2021 due to completion of major tests and project closeout. | | | |
| ***Title:*** Lightweight Short Range Guided Missiles (USSOCOM)<br><br>***Description:*** FY 2020 New Start – This project comparatively tests man portable, shoulder fired missile systems that utilize seeker technology for engaging moving or static targets at extended ranges compared to existing unguided weapons systems within the USSOCOM inventory. If successful, this technology will transition to USSOCOM's Program Executive Office Special Operations Forces Warrior for follow-on procurement.<br><br>***FY 2020 Plans:***<br>Test planning and contract preparation occur in 1Q-3Q FY 2020. System acquired and initial laboratory performance testing initiates in 4Q FY 2020. This project continues in FY 2021 with FY 2021 funds.<br><br>***FY 2021 Plans:***<br>Laboratory performance testing continues through 2Q FY 2021. Live fire testing commences in 3Q FY 2021. This project continues in FY 2022 with FY 2021 funds with completion of live fire testing, warhead characterization and final test and closeout reporting.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding increases in FY 2021 to support major test events. | 0.000 | 0.550 | 1.109 |
| ***Title:*** Mine Clearance Line Charge Replacement<br><br>***Description:*** FY 2020 New Start – This project will comparatively test the performance and reliability of modern mine clearing technologies against the legacy MK-154 Mine Clearing Line Charge (MICLIC). The MICLIC, which is 1950's era technology has a | 0.000 | 1.090 | 0.965 |

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| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| history of reliability, safety, and availability issues. If successful, this technology will transition to the U.S. Marine Corps' Portfolio Manager for Logistics Combat Element Systems to replace/supplement existing MK-154 MICLICs.<br><br>***FY 2020 Plans:***<br>Initiate test planning and contract award preparation in 1Q-2Q FY 2020. Conduct test readiness review 3-4 Q FY 2020. This project continues in FY 2021 with FY 2021 funds.<br><br>***FY 2021 Plans:***<br>Conduct three phases of live fire testing in 1Q-4Q FY 2021. This project continues in FY 2022 with FY 2021 funds. Live fire testing concludes and final test and closeout reports are completed in 1Q FY 2022.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding decreases in FY 2020 with conclusion of major test events. | | | |
| ***Title:*** Turreted Mortar System (Army)<br><br>***Description:*** FY 2020 New Start - This project will test a turreted mortar system to fill high risk capability gaps within the Brigade Combat Team and across the Multi-Domain Battlefield concept. The system will increase lethality and survivability through extended range, low angle, 360 degree delivery capability, and fire on the move capabilities with overhead protection. If successful, this technology will transition to the Army's Armored Multi-Purpose Vehicle Program Office in FY 2022.<br><br>***FY 2020 Plans:***<br>Test planning and contract preparation occur in 1-3Q FY 2020. Test article delivery and initial performance testing will occur in 4Q FY 2020. This project continues in FY 2021 with FY 2021 funds.<br><br>***FY 2021 Plans:***<br>Live fire testing will occur 1-3Q FY 2021. This project continues in FY 2022 with FY 2021 Funds.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding increases in FY 2021 to support major live fire test events. | 0.000 | 0.250 | 0.877 |
| ***Title:*** Improved Lean Services Architecture (Air Force)<br><br>***Description:*** FY 2020 New Start - This project will test software based on published open standards to enhance communications between weapon platforms, ground teams, and command and control centers across different radio networks. This will increase interoperability and save time and money through rapid and flexible configuration of networked devices. This project addresses the Fully Networked Command, Control, and Communications focus area. If successful, this technology will transition to the Air Force Special Operations Command's Airborne Mission Networking Program of Record. | 0.000 | 0.500 | - |

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| ***FY 2020 Plans:***<br>Initiate test planning and contract award in 1-2Q FY 2020. Laboratory testing will initiated in 3Q FY 2020. Field demonstration will occur in 4Q FY 2020. This project concludes in FY 2021 using FY 2020 funds.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The project funding concludes in FY 2020. | | | |
| ***Title:*** Low Cost Innovative Projects (Projects Less Than One Million Dollars Each): | 13.065 | 11.613 | 8.407 |
| ***Description:*** The OSD Comparative Technology Office in execution of the FCT Program selects multiple low cost projects in the areas of Force Application, Force Protection, Force Support, Logistics, Anti-Access/Area Denial, Robotics and Autonomous Systems, Interoperability and Countering Unmanned Systems. These projects were selected to deliver prototypes for evaluation, assessment, and Service adoption within 12 to 36 months.<br><br>Projects:<br>-Civil Affairs Solution-Army Analytics (USSOCOM): This project tests intelligence software that fuses imagery from UAS and satellites with other sensor data and applies uses AI/ML to rapidly provide actionable analytics. This technology supports Department of Defense Civil Affairs operations by analyzing population migration caused by conflict or natural disasters to enabling dynamic planning for Large Scale Operations. If successful, this technology will be available for transition to the Army's Distributed Common Ground System Program of Record. This project was approved out-of-cycle and initiated test planning in 4Q FY 2019. This project continues in FY 2020 with FY 2020 funds.<br>-Insensitive Munitions Fuze for the M67 Fragmentation Hand Grenade (Army): Comparatively tests off-the-shelf hand grenade fuzes to provide increased safety to the soldier while maintaining lethality for the widely used M67 fragmentation hand grenade. The M67 has been in use since the 1960's and does not meet current Insensitive Munitions safety standards. If successful, this technology will transition to Army, Program Executive Office Ammunition for follow on acquisition. Test articles delivered and initial safety testing occurred in 4Q FY 2019. This project continues in FY 2020 with FY 2020 funds.<br>-Panoramic Infrared Sensor Test (Navy): Comparatively tests foreign naval panoramic Infrared sensors with autonomous detection capabilities to enhance shipboard detection and tracking of both surface and air targets to include low, slow, and SUAS. If successful, this technology will transition to the Navy's Program Executive Office for Integrated Warfare Systems for insertion into the future Guided Missile Frigate (FFG(X)) and Supercarrier CVN I-Stalker programs. Test articles received and acceptance testing began in FY 2019. This project continues in FY 2020 with FY 2020 funds.<br>-Accurate Tracking & Unmanned Underwater Vehicle Navigation (Navy): This project tests sensors that enable accurate real-time tracking of unmanned underwater systems without the need for a high-cost Inertial Navigation Systems. If successful, this technology will be available for transition to Navy Unmanned Underwater Vehicle (UUV) and Remotely Operated Vehicles programs of record. Test articles procured in 1Q FY 2019. Lab testing occurred in 2Q FY 2019. Platform integration occurred 3Q | | | |

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| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| FY 2019. Operational demonstration occurred in 4Q FY 2019. This project will continue in FY 2020 with FY 2019 funds. PM will make a transition decision and close-out report will be completed by 2Q FY 2020.<br>-Aerostable Penetrator (Army): Evaluates a foreign off-the-shelf 2.75-inch rocket motor integrated with a prototype U.S. developed flachette warhead to optimize lethality against light armor targets dispersed over an area. This project will demonstrate an affordable replacement solution for Cluster Munitions. If successful, this capability is anticipated to transition to the Army's Joint Attack Munition Systems Program Office. Additional test articles were received and characterization testing completed in 3Q FY 2019. This project continues in FY 2020 with FY 2019 funds.<br>-Autonomous Aircraft Material Maintenance (Navy): This project tests a trailer-mounted, autonomous cold spray metallization technology for in-situ repair of corrosion damaged areas on aircraft. If successful, the technology will be available for follow-on procurement and fielding by the Navy's Fleet Readiness Centers. The project completed several demonstration events in FY 2019 for the military aviation community. This project continues in FY 2020 with FY 2019 funds.<br>-Diagnostics/Prognostics Test for Traumatic Brain Injury (TBI) (USSOCOM): This project conducts clinical studies to provide an assessment of the effectiveness of using a panel of specific micro ribonucleic acid (miRNA) biomarkers to detect a traumatic brain injury. The ability to objectively diagnose a TBI within 15 minutes allows medical providers to properly asses, evacuate, or return to duty military personnel in lieu of prolonged observation or evacuation that decreases readiness. If successful, the technology would be incorporated as a diagnostic aid at military treatment facilities. Through the follow-on development of a portable diagnostic system (PDS), the Diagnostic/Prognostic Test for TBI will be incorporated into the USSOCOM Tactical Combat Casualty Care Program of Record. The initial study was completed in 2Q FY 2019. Data collection continued in 3Q-4Q FY 2019 with a larger population to meet Food and Drug Administration requirements proving product viability. This project continues in FY 2020 with FY 2019 funds.<br>-Multi-Agent Identification Kit and Equipment (MIKE) Butt-pack (Army): Tests an off-the-shelf colorimetric chemical detection system currently in use with NATO assembled into a small, lightweight packaging configuration for U.S. military use. Enhances interoperability between U.S. and NATO forces and reduces resupply requirements and life cycle costs. If successful, the technology will be available for immediate purchase by Special Operations units and will be pursued for acquisition by the Army through the Guardian Joint Program Management Office. The test articles were demonstrated during the Army Experimental Warfighter Exercise in 2Q FY 2019 and underwent soldier testing in 4Q FY 2019 with live agents at White Sands. This project continues in FY 2020 with FY 2019 funds.<br>-Night Vision Device Capable Deck Status Display (Navy): This project evaluates a Deck Status Display currently in use with over ten countries that provides landing status to pilots through night vision compatible symbology instead of colors enabling safer night landing operations. If successful, this project will transition to the Navy’s Aircraft Launch and Recovery Equipment Program of Record. Test articles underwent acceptance testing in 4Q FY 2019. This project continues in FY 2020 with FY 2019 funds.<br>-Quantum Communication, Cryptography, and Networking for Secure Satellite Communications (Air Force): This project evaluates a Quantum Key Distribution System (QKDS) for application to high priority encryption requirements. QKDS enables secure encrypted communication without the need to pre-generate, store, and secure large numbers of encryption keys. Quantum | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
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| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603133D8Z / *Foreign Comparative Testing* | **Project (Number/Name)**<br>313 / *Foreign Comparative Testing* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| cryptography technology promises secure encryption, while making network intrusion without detection impossible. Enhances DoD capabilities in the Quantum science focus area. If successful, the technology will transition to the Air Force Space and Missile Systems Center and Air Force Global Strike Command for satellite payload and ground station applications. Test articles received and laboratory testing completed in FY 2019. This effort continues in FY 2020 with FY 2019 funds.<br>-Reserve Battery for Munitions (Army): This project comparatively tests foreign off-the-shelf reserve battery solutions for use with medium caliber, mortar, and artillery applications to enhance the industrial base. If successful, the Army's Armaments Research Development and Engineering Center will pursue acquisition through either direct purchase from a foreign source or licensed production by a U.S. company. This project completed laboratory testing in 2Q FY 2019 and initiated live fire testing in 4Q FY 2019. This effort continues in FY 2020 with FY 2019 funds.<br>-Rapid Obscuring System (ROSY) (Army): This project comparatively tests advanced vehicle obscuring smoke grenade systems from Germany and France. Modern off-the-shelf systems have potential to replace decades old technology and enable 360 coverage in both the visible and infrared spectrums. If successful, this technology will be available for transition to the Army's Program Manager for Vehicle Protection Systems. Static grenade testing was conducted in 3Q FY 2019. Live fire testing from a Bradley Fighting Vehicle occurred in 4Q FY 2019. This effort continues in FY 2020 with FY 2019 funds.<br>-Tactical Debriefing System (Navy): This project evaluates a mission and military exercise debriefing tool currently in use with the Finnish Air Force to increase the quality of and reduce the time required to generate after action reviews. The system will be modified to support Electronic Warfare debriefing, a capability that does not currently exist. If successful, this technology will transition to the Navy's aircraft mission debriefing system program. Software received and integrated for acceptance testing in 4Q FY 2019. This project continues in FY 2020 with FY 2019 funds.<br>- 2.75 Inch Guided Rocket System for Asymmetric Force Engagement of Fast In-Shore Attack Craft (FIAC) for (Navy): This project evaluates a "fire and forget" rocket system with an advanced imaging infrared seeker to counter FIAC swarms. If successful, the technology will transition to the Office of Naval Research for follow-on prototype evaluations prior to fielding. Characterization testing occurred in FY 2019 and live-fire testing will be completed in FY 2020 with FY 2019 funds.<br>-HALO Integration with Common Remotely Operated Weapon System (CROWS) (Army): The CROWS provides the capability to locate and attack targets without exposing operators to enemy fire. This project tests an image processor technology add-on to the CROWS that fuses day and night images to enhance target detection and reduce motion blur to increase lethality. If successful, this capability is anticipated to transition to the Army's CROWS Program of Record. This project continued in FY 2019 with operational prototype testing. This project continues in FY 2020 with FY 2019 funds and will complete in final test report and transition decision in 3Q FY 2020.<br>-Supercavitating Ammunition (NAVY): This project comparatively tests small caliber ammunitions with supercavitating properties for use in the undersea environment. If successful, the ammunition will be available for immediate transition to Naval Special Forces. Test planning initiated in 2Q FY 2019. This project continues in FY 2020 with FY 2019 funding. Live fire demonstration scheduled for 1Q FY 2020. A final test report and transition decision is scheduled for 2Q FY 2020. Project closes in FY 2020 with FY 2019 funding. | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
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| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603133D8Z / *Foreign Comparative Testing* | **Project (Number/Name)**<br>313 / *Foreign Comparative Testing* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| -Blood and IV Warmer (NAVY/USMC): This project tests a lightweight, portable blood warmer that is suitable for expeditionary use. If successful, this technology will transition to U.S. Marine Corps Product Manager Supply & Maintenance Systems through the Authorized Medical Allowance List Modernization Program for follow on acquisition. Test article contract awarded in 3Q FY 2019. Acceptance testing completed in 4Q FY 2019. This project continues in FY 2020 with FY 2019 funding and completes in 3Q FY 2020 with decision to pursue approval by the Food and Drug Administration prior to fielding.<br>-Smartshooter Evaluation (Army): This project evaluates an intelligent fire control system for assault rifles that is capable of identifying, selecting, and locking onto stationary or moving targets. This technology significantly improves shooter accuracy and probability of hit while reducing engagement times. If successful, the Army's Program Manager for Soldier Weapons will transition the technology into its Next Generation Fire Control development program. Test articles acquired, tested, and demonstrated in FY 2019. This project continues in FY 2020 with FY 2020 funds.<br>-Transparent Ceramic Armor (Army): This project evaluates armor technology that is fifty percent lighter and thinner than existing glass-based systems for application on rotary wing and other military platforms. This technology provides a cost effective solution versus competing products. If successful, the technology will be incorporated into the CH-47 Multi-Impact Transparent Armor System program of record. Test articles received in 3Q FY 2019. This project continues in FY 2020 with FY 2019 funds.<br>-AT4 Confined Space Tandem Warhead (Army): This project tests the a new warhead for the existing AT4 84mm shoulder fired weapon system to increase lethality by enabling fire from enclosure and the ability to engage structures and light armored targets. Performance verification testing occurred in FY 2019. This project continues in FY 2020 with FY 2020 funds.<br>-Hydrogen Fuel Cell Technology for Small UAS (Air Force): This project comparatively tests foreign hydrogen fuel cells to increase the performance and range of Small UAS versus using traditional battery technology. If successful, this technology will transition to Air Force Special Operations Command Small UAS programs for follow-on procurement and fielding. Laboratory testing of individual fuel cells occurred in 1Q-2Q FY 2019. Safety certification and integration with platforms occurred in 3Q-4Q FY 2019. This project continues in FY 2020 with FY 2020 funds.<br>-Small Size Weight and Power (SWaP) Mid-Wave Infrared (MWIR) Camera for Small UAS (Air Force): This project evaluates the performance of a low-cost, small SWaP MWIR camera system for Small UAS. Existing MWIR cameras are too large and cost prohibitive Small UAS applications. If successful, this technology will be available for transition to Air Force Research Laboratory on-going Small UAS development programs. Test articles received in 3Q FY 2019. Laboratory testing and gimbal integration occurred in 4Q FY 2019. This project continues in FY 2020 with FY 2019 funds. Final test and closeout reports are expected 3Q FY 2020 using FY 2019 funding.<br>-Low-Cost Autonomous Target Classification (L-CATC) (Navy): This project conducts at-sea testing of underwater passive acoustic sensors and associated processing software. This technology provides an increased probability of detection and classification for both surface and submerged vessels. Test article engineering change initiated in 4Q FY 2019. Final test and closeout reports are expected 1Q FY 2020 using FY 2019 funds. | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
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| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603133D8Z / *Foreign Comparative Testing* | **Project (Number/Name)**<br>313 / *Foreign Comparative Testing* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| -Energy Storage for Directed Energy Weapons and Sensors (Navy): This project tests graphene based ultra-capacitors for enhancing the capabilities energy storage systems. If successful, the technology will transition to the Multifunction Energy Storage Future Naval Capability effort. Completed final test and closeout reports in 1Q FY 2019.<br>-Enhancing DoD Circuit Card Repair (Navy): This project evaluates a portable circuit card test system that could significantly enhance Department of Defense diagnostic capabilities. Test article contract awarded in 3Q FY 2019. Test articles received in 4Q FY 2019. This project continues in FY 2020 with FY 2019 funds. Acceptance testing will complete in 1Q FY 2020. Information assurance evaluation will complete in 2Q FY 2020 and demonstrations by maintenance personnel in the field will complete in 3Q FY 2020. Final test report and project closeout to complete in 4Q FY 2020.<br>-Simultaneous Multi-Channel Modem (USSOCOM): Evaluates an off-the-shelf device that autonomously disaggregates and transports data over multiple networks simultaneously. Phase I laboratory testing was completed in FY 2019. This technology did not meet requirements and will not proceed to Phase II field testing. A final test report and project closeout will complete in 1Q FY 2020 with FY 2019 funds.<br>-105 Millimeter Family of Multi-Purpose Munitions (Army): This project tests two variants of a multi-purpose 105 millimeter munitions including High Explosive (HE) and Anti-Personnel/Anti Material for increased lethality, safety, and reliability. If successful, the technology will be available for transition to the Army's Mobile Protected Firepower vehicle program. Test article contract awarded in FY 2019. This project continues in FY 2020 with FY 2020 funds.<br>-Uncooled 120 Hertz Longwave Infrared Focal Plane Arrays for Night Vision Sensors (Army): This project tests foreign developed focal plane array technology for next generation night vision devices. Recent advancements in optical technology offer increased resolution and refresh rates for night vision applications, which enable enhanced situational awareness. If successful, this technology will be available for transition to Army's Project Manager for Soldier Sensors and Lasers for insertion into programs of record. Test article acquisition and integration occurred in FY 2019. This project continues in FY 2020 with FY 2020 funds.<br>-Modular Airdrop Platform (Army): This project tests an innovative airdrop platform system with underside airbags that eliminates the need for energy dissipating material. The technology will increase lethality and readiness by enabling a rapid roll-on/off capability and will significantly reduce logistics costs. If successful, this technology will be available for transition to the Product Manager, Force Sustainment Systems - Cargo Air Delivery for insertion into the Advanced Low Velocity Airdrop System Program of Record. Ground testing completed in 3Q FY 2019. This project continues in FY 2020 with FY 2020 funds.<br>-Magnetic Signature Duplicator System (Army): This project evaluates the performance of a foreign magnetic signature duplicator and against known landmine threats. If successful, the technology will be available for transition to the Army's Mounted Detection System Program of Record for follow on acquisition. Test planning and contract award occurred in FY 2019. This project continues in FY 2020 with FY 2020 funds.<br>-Personal Dosimeter as an Emergency Response System (Army): This project tests foreign Dosimeter technology along with an automated field analytics system for rapid identification and triage of individuals exposed to radiological or nuclear substances. This technology will be tested alongside the current Joint Personal Dosimeter to determine capabilities in an operational environment. If successful, this technology will transition to the Joint Program Manger Guardian program of record. This project | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
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| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603133D8Z / *Foreign Comparative Testing* | **Project (Number/Name)**<br>313 / *Foreign Comparative Testing* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| was initiated out-of-cycle in 4Q FY 2019. Initial test planning and contract preparation occurred in 4Q FY 2019. This project continues in FY 2020 with FY 2020 funds.<br>-Artificial Intelligence (AI) Neuromorphic Chip (Army): This project evaluates a low cost neuromorphic chip to replace the current paper and pencils method for counting 120-millimeter mortar rounds to more accurately determine weapon system life cycle maintenance. This effort demonstrates a tactical application of AI, will increase readiness, and could save millions of dollars in maintenance cost. If successful, this technology will be available for transition to the Army's Stryker Program Office for follow on acquisition. This project was initiated out-of-cycle in 4Q FY 2019. Initial test planning and contract preparation occurred in 4Q FY 2019. This project continues in FY 2020 with FY 2020 funds.<br>-Vector Engine Processor for Use with Legacy Hypersonic Codes (Navy): This project evaluates a high-performance vector processor to significantly reduce time required to evaluate hypersonic designs. If successful, the technology will transition to the High Performance Computing Modernization Program. This project was initiated out-of-cycle in 4Q FY 2019. Initial test planning and contract preparation occurred in 4Q FY 2019. This project continues in FY 2020 with FY 2020 funds.<br>-High Powered Microwave (HPM) Electro-Optic Electromagnetic Field Sensors (Air Force): This project tests various foreign Electro-Optic Electromagnetic Field sensors for use at Department of Defense test ranges to enhance Directed Energy Weapon Research, Development, and Test and Evaluation efforts. Current radio frequency antennas are too large to embed within HPM targets and thus, are unable to accurately measure HPM effects. If successful, the technology will transition to the Air Force Research Laboratory for follow on procurement as a test asset in support of future HPM test and evaluation efforts. This project was initiated out-of-cycle in 4Q FY 2019. Initial test planning and contract preparation occurred in 4Q FY 2019. This project continues in FY 2020 with FY 2020 funds.<br><br>***FY 2020 Plans:***<br>-Accelerating Human Performance Discovery (Army): FY 2020 New Start - This project evaluates an automated live-cell imaging and analysis microscope system to enable high-throughput and reduce the time required to conduct basic and applied biological research in support of accelerating human performance discovery. If successful, this technology will initially transition to the Army's Combat Capabilities Development Command, Soldier Center prior to further adoption across the Department of Defense medical research community. Test planning and contract award will occur in 1Q-2Q FY 2020. Receive test articles and conduct user training in 3Q-4Q FY 2020. This project continues in FY 2021 with FY 2021 funds.<br>-Counter Unmanned Aerial System (CUAS) for Vehicle Protective Systems (Army): FY 2020 New Start – Evaluates a CUAS system for application to ground vehicles that uses passive radio frequency technology to detect and track UAS targets and provides the capabilities to determine operator origin and non-kinetically defeat UAS threats. If successful, the technology will transition to the Army's Program Manager for Vehicle Protection Systems. Test planning and contract award preparation to occur in 1Q FY 2020. Test articles to be delivered in 2Q FY 2020. Initial demonstrations to occur in 3Q-4Q FY 2020. This project continues in FY 2021 with FY 2021 funds. | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
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| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603133D8Z / *Foreign Comparative Testing* | **Project (Number/Name)**<br>313 / *Foreign Comparative Testing* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| -Nano-Clay Seals for Long Service Life (Air Force): FY 2020 New Start - This project tests the service life of emerging nano-clay enhanced compression seal materials against the service life of existing nitrile rubber. This technology will extend seal service life significantly reduce life cycle maintenance costs for aircraft engines by reducing the number of required overhauls. If successful, the Air Force Research Laboratory will modify the current seal specification to include nano-clay materials. Follow-on procurement will occur through the Defense Logistics Agency. Test planning and test article acquisition will occur in 1Q FY 2020. Phase I Material Characterization will occur in 2Q-3Q FY 2020. Phase II service life testing will occur in 4Q FY 2020. This project continues in FY 2021 with FY 2021 funds.<br>-Precision Vertical Take-Off and Landing Unmanned Aerial System (VTUAS) Recovery (Navy): FY 2020 New Start- This project evaluates a platform agnostic ultrasonic based sensor system for vehicles and vessels to enable autonomous recovery of VTUAS on stationary or moving platforms. If successful, the technology will be available for transition to Navy and Army UAS Programs for follow-on procurement and fielding. Test planning contract award will occur in 1Q-2Q FY 2020. Delivery of test articles will occur in 3Q FY 2020. Developmental testing will be performed in 4Q FY 2020. This project continues in FY 2021 with FY 2021 funds.<br>-Artificial Intelligence (AI) Neuromorphic Chip (Army): Prototype integration and testing to occur throughout FY 2020. PM will make a transition decision and close-out report will be completed in 4Q FY 2020.<br>-Vector Engine Processor for Use with Legacy Hypersonic Codes (Navy): Test article acquisition will occur in 1Q FY 2020. Performance testing will begin in 2Q FY 2020 and complete in 4Q FY 2020. This project continues in FY 2021 with FY 2020 funds to complete testing, final test report, and project closeout.<br>-Personal Dosimeter as an Emergency Response Dosimetry System (Army): An interim test report will be provided in 4Q FY 2020 and this project continues in FY 2021 with FY 2020 funds. Operational field testing will continue into 3Q FY 2021 and culminate in a demonstration with live radiological material in 4Q FY 2021. The results will be provided to the Joint Product Leader for Radiological and Nuclear Defense who serves as the transition agency for the Dosimeter Technology. This project will complete in FY 2021.<br>-Civil Affairs Solution-Army (CAS-A) Analytics (USSOCOM): Algorithms will be acquired and refined in 1Q-2Q FY 2020. Software integration and operational testing to commence in 3Q FY 2020. Testing will continue into 4Q FY 2020 using primarily open source data to determine best processes and procedures to create usable products to support the analysis process. This project continues in FY 2021 with FY 2021 funds.<br>-Cryo-cooler For Distributed Aperture System (Air Force): This project combines a new cryo-cooler technology with leading edge infrared sensor technology to increase reliability, extend the life of sensor equipment, and reduce costs. This technology will also decrease cool down time enabling aircraft to meet critical launch timelines. This project completed test article integration and reliability testing in 3Q FY 2019 with FY 2018 funds. This project continues in FY 2020 with FY 2020 funds. Test article integration will occur in 2Q FY 2020. Component level reliability testing to occur in 3Q FY 2020. System level reliability testing to occur in 4Q FY 2020. PM will make a transition decision and close-out report will be completed in 4Q FY 2020. | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
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| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603133D8Z / *Foreign Comparative Testing* | **Project (Number/Name)**<br>313 / *Foreign Comparative Testing* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| -Insensitive Munitions Fuze for the M67 Fragmentation Hand Grenade (Army): Conduct down select in 1Q FY 2020. Conduct fragmentation testing and lethality analysis in 2Q-3Q FY 2020. Complete final test and close-out reports in 4Q FY 2020.<br>-Panoramic Infrared Sensor Test (Navy): Integration and shipboard testing will be conducted in FY 2020. Final test and closeout report will be completed in 4Q FY 2020.<br>-Smartshooter Evaluation (Army): This project will continue with live fire testing throughout FY 2020. Final test and closeout reports will be submitted in 4Q FY 2020.<br>-AT4 Confined Space Tandem Warhead (Army): Live fire testing will take place in 1Q-2Q FY 2020. The project will complete in 3Q FY 2020 with a final test and closeout reports.<br>-Modular Airdrop Platform (Army): Unloaded air drop testing will occur in 1Q-2Q FY 2020 followed by drops utilizing generic payloads in 3Q FY 2020. Final airdrop demonstration at Fort Bragg will take place in 4Q FY 2020. The project will conclude by the end of FY 2020 with a final test and closeout report.<br>-105 Millimeter Family of Multi-Purpose Munitions (Army): Characterization and operational testing will occur in 1Q-3Q FY 2020. Final test and closeout reports to be delivered 4Q FY 2020.<br>-Uncooled 120 Hertz Longwave Infrared Focal Plane Arrays for Night Vision Sensors (Army): Size, weight, and power verification will occur in 1Q FY 2020. Frame rate verification will also occur in 1Q FY 2020. Sensitivity testing will occur in 2Q FY 2020. Thermal time constant verification will occur in 3Q FY 2020. Extended solar exposure testing will complete in 4Q FY 2020. Final test report and project closeout will occur in 4Q FY 2020.<br>-Magnetic Signature Duplicator Systems (Army): Operational testing to determine effectiveness and suitability of the system by combat engineers, infantry, and cavalry and armor forces will occur in 2Q-4Q FY 2020. The project will complete with a closeout report in 4Q FY 2020.<br>-Hydrogen Fuel Cell Technology for Small UAS (Air Force): Operational testing will occur throughout FY 2020. Project will complete with a final test and closeout reports in 4Q FY 2020.<br>-High Powered Microwave (HPM) Electro-Optic Electromagnetic Field Sensors (Air Force): Test articles will be received in 3Q FY 2020 and low-level lab testing will commence. This project continues in FY 2021 with FY 2021 funds. | | | |
| ***FY 2021 Plans:***<br>- Accelerating Human Performance Discovery (Army): FY 2020 New Start- Lab testing and end product cross validation studies will occur in 1-2Q FY 2021. If lab testing is successful, full scale studies will occur in 3Q-4Q FY 2021. This project completes in FY 2022 with FY 2021 funds.<br>-Counter Unmanned Aerial System (CUAS) for Vehicle Protective Systems (Army): FY 2020 New Start- Vehicle integration and field testing and demonstrations to occur in 1Q FY 2021. Final test report and project closeout to complete by 3Q FY 2020.<br>-Nano-Clay Seals for Long Service Life (Air Force): FY 2020 New Start- Phase II material qualification occurs in 1-3Q FY 2021 with long term compression set testing and compressive stress relaxation testing. Phase III component performance testing occurs in 4Q FY 2021. Final test and closeout reports will be delivered by the end of FY 2021. | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
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| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603133D8Z / *Foreign Comparative Testing* | **Project (Number/Name)**<br>313 / *Foreign Comparative Testing* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| - Precision Vertical Take-Off and Landing UAS (VTUAS) Recovery Navy): FY 2020 New Start- Operational testing of the units will occur in 1-3Q FY 2021. Interference testing and vulnerability assessment will occur in 4Q FY 2021. Final test and closeout reports will be delivered by the end of FY 2021.<br>-Civil Affairs Solution-Army (CAS-A) Analytics (Army): Operational testing to occur throughout FY 2021. A final test report and transition decision will occur in 4Q FY 2021.<br>-High Powered Microwave (HPM) Electro-Optic Electromagnetic Field Sensors (Air Force): Operational testing under harsh field conditions will occur during an HPM experiment in 3Q FY 2021. Final test and closeout reports will be provided by the end of FY 2021.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>FY 2020 funding commitment is reduced as currently selected projects complete their 12-36 month evaluation and are transitioned. | | | |
| ***Title:*** Foreign Comparative Testing Prototype Development Focus Areas | 0.247 | 1.637 | 10.878 |
| ***Description:*** Previously funded effort. The FCT program will select new projects to evaluate allied/partner nation technologies that address emerging DoD capability gaps and provide substantial cost, schedule, and/or performance benefit to the warfighter. As projects are selected, they will be reported individually. Prototype development will be aligned to the National Defense Strategy (NDS) and current Office of the Under Secretary of Defense, Research and Engineering focus areas to deliver increased readiness and a more lethal Joint Force while strengthening alliances, attracting new partners, and achieving greater performance and affordability.<br><br>***FY 2020 Plans:***<br>During FY 2020, FCT will prioritize selecting projects supporting the NDS and DoD modernization priorities:<br>- Fully Networked Command Control and Communications<br>- Space<br>- Autonomous Systems<br>- Cybersecurity – Offense and Defense<br>- Hypersonics – Offense and Defense<br>- Directed Energy<br>- Machine Learning and Artificial Intelligence<br>- Microelectronics<br>- Quantum Technology<br>- Bio-technology<br>- 5G | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
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| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603133D8Z / *Foreign Comparative Testing* | **Project (Number/Name)**<br>313 / *Foreign Comparative Testing* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| In addition to the above areas of technology development, FCT will select programs that resolve emerging urgent operational needs with field-ready allied technologies and programs that promise substantial life-cycle cost savings/avoidance in fielded systems.<br><br>***FY 2021 Plans:***<br>FCT anticipates supporting ten to twelve projects spread across the focus area priorities in FY 2021. Deliverables will include integrated products that enhance the warfighters capabilities or technology that advances the battlefield advantage of the DoD across the multi-domain battlefield capabilities. This will be done through test and evaluation of prototypes, demonstrations, and concept experimentation in coordination with the Services and United States Special Operations Command and other DoD Agencies.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>This funding will be allocated for the selection of new projects that will commence in FY 2020 and FY 2021. Projects will be selected through a merit-based process and will address current and future OUSD R&E modernization priorities. Funding increases from FY 2020 to FY 2021 as commitments to on-going projects continues and new projects are approved. | | | |
| **Accomplishments/Planned Programs Subtotals** | 23.867 | 24.970 | 25.183 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Successful FCT projects support capability acquisition in several ways: technology upgrade insertion into a current platform or program providing greater capability or prolonging the life of the weapon system, informed/refined requirements for planned systems, or direct transition/procurement. FCT leverages the Services' and Defense Agencies' most efficient and effective acquisition approaches for rapid prototyping. This includes using Other Transaction Authorities and new or existing contract vehicles within middle-tier acquisition strategy.

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
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| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603225D8Z *I Joint DOD/DOE Munitions Technology Development* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 17.959 | 17.941 | 18.773 | 18.873 | - | 18.873 | 19.285 | 19.621 | 20.125 | 20.535 | Continuing | Continuing |
| 225: *Joint DOD/DOE Munitions* | 17.959 | 17.941 | 18.773 | 18.873 | - | 18.873 | 19.285 | 19.621 | 20.125 | 20.535 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

The mission of the Department of Defense (DoD)/Department of Energy (DOE) Joint Munitions Technology Development Program (JMP) is to develop new and innovative warhead, advanced and disruptive explosive, fuzing, weapons effects, and lifecycle technologies and tools to enable significant improvements in conventional munitions. The JMP supports the development and exploration of advanced munitions concepts and enabling technologies that precede Service-specific system engineering. A Memorandum of Understanding signed in 1985 by DoD and DOE provides the basis for the cooperative effort and for cost-sharing the long-term commitment. The DoD JMP funds budgeted in this justification are matched, at a minimum, dollar for dollar by DOE funds. Through this interdepartmental cooperation, DoD's relatively small investment leverages DOE's substantial investments in intellectual capital and highly specialized skills, advanced scientific equipment and facilities, and computational tools not available within DoD. Under the auspices of the JMP, the integration of DOE technologies with Joint and Individual Services' needs has provided major advances in warfighting capabilities over many years and continues to play a crucial role in the exploration, development, and transition of new technologies needed by the Services.

The JMP has established a successful collaborative community of DoD and DOE scientists and engineers that develop technologies of interest to both Departments within a structured framework of technical reviews and scheduled milestones. The JMP is administered and monitored by the Office of the Undersecretary of Defense for Research and Engineering (OUSD(R&E)) and reviewed annually by the Munitions Technical Advisory Committee (TAC), which is comprised of munitions laboratory technical directors and senior executives from the Army, Navy, Air Force, OUSD, DOE, and the National Nuclear Security Administration (NNSA). Projects are organized in five Technology Coordinating Groups (TCG) that bring together the disciplines necessary to properly evaluate technical content, relevance, and progress. The TCGs conduct semi-annual technical peer reviews of JMP projects and plans. DoD Service laboratory technical experts lead each of the TCGs to ensure that the technologies under development address high-priority DoD gaps, needs, and challenges. The The JMP is a focal point for collaborative work by nearly 600 DoD and DOE scientists and engineers. Technical leaders from both Departments consider the JMP a model of cooperation, both within their respective departments and between departments. The highly challenging technical objectives of the 30 current projects require multi-year efforts and sustained, long-term investments to achieve success.

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603225D8Z *I Joint DOD/DOE Munitions Technology Development* |

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 18.602 | 18.773 | 19.048 | - | 19.048 |
| Current President's Budget | 17.941 | 18.773 | 18.873 | - | 18.873 |
| Total Adjustments | -0.661 | 0.000 | -0.175 | - | -0.175 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | -0.658 | - | | | |
| • Other Adjustments | -0.003 | - | -0.156 | - | -0.156 |
| • Economic Assumption | - | - | -0.019 | - | -0.019 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 3 | R-1 Program Element (Number/Name)<br>PE 0603225D8Z / *Joint DOD/DOE Munitions Technology Development* | Project (Number/Name)<br>225 / *Joint DOD/DOE Munitions* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 225: *Joint DOD/DOE Munitions* | 17.959 | 17.941 | 18.773 | 18.873 | - | 18.873 | 19.285 | 19.621 | 20.125 | 20.535 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

The Joint Munitions Program (JMP) seeks to develop technological advances in several munitions subject areas aligned with key objectives of the National Defense Strategy (NDS), namely to build a more lethal force by increasing the lethality of munitions while preparing for a sustained investment in conventional munitions technology. These include: 1) improved modeling and simulation tools for munitions and system design and evaluation, including evaluation of lethality, vulnerability and the design of energetic materials (EM), 2) novel experimental techniques and material property databases to support modeling and simulation, 3) higher power and more thermally stable explosives, 4) miniaturized, lower-cost, and higher reliability fuzes, initiators, power systems, and sensors, 5) design tools to enable development of higher performance warheads and weapons, such as penetrators, that are hardened against high impact loads, and 6) tools to assess the health and reliability of the munitions stockpile. The supporting experimental research requires the development of new technologies related to the synthesis, processing, formulation, and characterization of advanced munition materials, components, and systems. This involves energetic material research, new fuzing concepts, dynamic testing of munition materials, and advanced characterization including high-rate in-situ diagnostics.

The JMP projects are divided into five technical focus areas: 1) Computational Mechanics and Material Modeling, 2) Energetic Materials, 3) Initiators, Fuzes, and Sensors, 4) Warhead and Penetration Technology, and 5) Munitions Lifecycle Technologies.

Each of the 30 projects has a detailed five year plan with objectives, tasks, deliverables and milestones that is approved annually by a group of 20-plus SES members from the DoD munitions laboratories.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Joint DoD/DOE Munitions Technology Development | 17.941 | 18.773 | 18.873 |
| ***Description:*** DoD/DOE Munitions Technology Development focuses on the following key areas:<br>• Computational Mechanics and Material Modeling - develops physics-based computational tools, material models, and calibration and validation databases that support the design and development of weapon systems.<br>• Energetic Materials (EM) technical area - develops new ingredients and formulations and supporting technologies to satisfy the competing requirements for smaller, more lethal, and less sensitive munitions.<br>• Initiators, Fuzes, and Sensors - develop new materials, components, diagnostic techniques, and modeling and simulation tools for fuzing systems.<br>• Warhead and Penetration Technology - supports the development of new warheads and penetrator weapons through advances in materials processing and characterization, instrumentation, and computational codes.<br>• Munitions Lifecycle Technologies - supports improving the Department's ability to understand measure, predict, and mitigate safety and reliability problems caused by materials aging and degradation in weapons systems. | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603225D8Z / *Joint DOD/DOE Munitions Technology Development* | **Project (Number/Name)**<br>225 / *Joint DOD/DOE Munitions* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***FY 2020 Plans:***<br>In FY2020 the JMP will reorganize its technical area structure to broaden its applicability to meet the Department of Defense's needs in weapons system technology development and more efficiently leverage Department of Energy investments in beneficial technology development. The new technical coordination groups (TCGs) reflecting this reorganization are:<br>- TCG I: Decision Tools: Computations and Material Modeling - Physics-based computational tools, material models, and calibration and validation databases that support the design and development of weapon systems<br>- TCG II: Delivery: Munition Systems and Delivery – Development of new architectures, materials, diagnostic techniques, and modeling and simulation applications for weapon delivery<br>- TCG III: Munition Controls: Munitions Command, Control, and Communication – Development of new designs, materials, diagnostic techniques, sensors, modeling, and algorithms for munitions command, control, and communication<br>- TCG IV: Lethal Effects: Ordnance and Target Effects - Develop new materials, components, diagnostic techniques, and modeling and simulation tools for improved lethality and energy release efficiency in weapons systems<br>- TCG V: Readiness: Munition Lifecycle Science and Technology – Methodology to quantify, predict, and mitigate safety, reliability, and readiness complications resulting from materials aging and degradation in weapons systems.<br><br>The portfolio of projects will be realigned under the new structure beginning in FY20.<br><br>• Computational Mechanics and Material Modeling – develop equations-of-state for additively manufactured polymers and extrudable explosives.<br>- Release the following M&S code updates: CTH Version 13.1; Sierra-Zapotec; Sierra/SM; ALE3D version 4.34; and MIDAS version 2.0.<br>- Integrate machine learning methodologies to enable automated ensemble generation and for Fast Running Model (FRM) development and validation.<br>- Complete (1) simulations of Dynamic Recrystallization (DRX) within ABAQUS and transfer to CCDC-ARL<br>- Complete multi-material and multi-velocity code development in Carta Blanca.<br>- Develop improved ignition and mechanics models for high explosives<br><br>• Energetic Materials (EM) technical area -<br>- Develop a JWL reactive model parameterization for LLM-210 from CYLEX tests.<br>- Deliver thin film characterization data to AFRL at Eglin AFB.<br>- Deliver CL-20 ink performance models to China Lake and AFRL at Eglin AFB.<br><br>• Initiators, Fuzes, and Sensors - | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603225D8Z / *Joint DOD/DOE Munitions Technology Development* | **Project (Number/Name)**<br>225 / *Joint DOD/DOE Munitions* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| - Perform integrated battery testing of conformal, thin-film thermal batteries.<br>- Release Thermally Activated Battery Simulator (TABS) v6.0 with full battery thermal/electrical capability.<br>- Develop unreacted and reacted equations of state for CL-20 powders<br>- Develop GaN and AlGaN based transistors for high voltage, high current, high di/dt solid state switches (1-2 kV, 50 A/ns) for compact firing sets<br>- Demonstrate 3D exploding foil initiator (EFI) simulations using GPU-based modeling;<br>- Demonstrate Inertial Terrain Aided Guidance (iTAG) modeling and simulation to provide real-time processing solution for weapons guidance;<br><br>• Warhead and Penetration Technology -<br>- Generate synthetic fragment data set for improvement and testing of fragment tracking software.<br>- Add a granular temperature model to ALE3D for improved modeling of MBX.<br>- Complete the development of the embedded fiber solver in GEOS-MPM to allow evaluation of failure and softening responses of damaged UHPC.<br><br>• Munitions Lifecycle Technologies -<br>- Characterization of novel coating technologies as thermal protection systems and their performance under thermal cycling.<br>- Create model for electrochemical kinetics/damage of aluminum and alloys under humidity and chloride-loading conditions.<br>- Transition material aging and reliability tools and data on DoD ignitors<br>- Develop predictive model for adhesive joint strength<br>- Complete a study on tantalum capacitor failures in COTS devices<br>- Deliver specifications for detonator-suitable CL-20 based plastic bonded explosive.<br>***FY 2021 Plans:***<br>In FY2021 the portfolio will be completely aligned with the TCG structure with a new Statement of Need process to identify and prioritize DoD S&T gaps and leverage DOE investment. This process is fully coordinated with OUSD(R&E) Hypersonics efforts and will be utilized to develop technology solutions for hypersonic weapons developments and existing and future conventional weapons systems.<br>• TCG 1 – Decision Tools will employ machine learning code development to support lethality assessments, Develop multi-physics modeling code development and updates (ALE3D, CTH), and corresponding experimental verification and validation to inform hypersonics warhead design.<br>• TCG 2 – Delivery will advance energetic material 3D printing for complex charges to inform hypersonic propulsion concepts.<br>• TCG 3 – Munition Controls will advance thin film thermal battery development and performance modeling for reduced munition footprint and stability in hypersonics environments, develop new initiation systems and characterization tools to reduce SWaP with | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603225D8Z / *Joint DOD/DOE Munitions Technology Development* | **Project (Number/Name)**<br>225 / *Joint DOD/DOE Munitions* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| increased thermal stability, mechanical survivability, and intelligent fuzing/firing response time, and develop new sensors (GPS-denied environments, proximity sensors) for extreme environments.<br>• TCG 4 – Lethal Effects will develop new high performance, low sensitivity energetic ingredients and new formulations, and characterization techniques to develop materials capable of withstanding demanding hypersonic environments (high temperatures, shock, vibration) while coupling these efforts with approaches for advanced warhead architectures and processing methods (additive manufacturing) to support hypersonic warhead design. Focus will also be put toward penetrator impact event modeling (terminal ballistics) and high strength concrete modeling code development to inform target effects.<br>• TCG 5 – Readiness will evaluate and quantify COTS device reliability studies to inform in-use and storage readiness for hypersonic components<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Small changes reflect minor budget fluctuations. | | | |
| **Accomplishments/Planned Programs Subtotals** | 17.941 | 18.773 | 18.873 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603288D8Z / *Science and Technology (S&T) Analytic Assessments* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 51.705 | 17.768 | 18.429 | 23.775 | - | 23.775 | 24.353 | 23.561 | 24.195 | 24.726 | Continuing | Continuing |
| 328: *Science and Technology Analytic Assessments* | 51.705 | 17.768 | 18.429 | 17.030 | - | 17.030 | 17.259 | 16.245 | 16.607 | 16.892 | Continuing | Continuing |
| 177: *Technology Watch/Horizon Scanning* | - | 0.000 | 0.000 | 6.745 | - | 6.745 | 7.094 | 7.316 | 7.588 | 7.834 | Continuing | Continuing |

**Note**

The Technology Watch/Horizon Scan efforts under Project code 177 were previously aligned under Program Element 0602234D8Z Project code 535 (Technical Intelligence). This project has been administratively realigned after the reorganization of the Under Secretary of Defense for Acquisition, Technology, and Logistics, but the scope of work and relative funding remains unchanged.

**A. Mission Description and Budget Item Justification**

This Program Element (PE) directly supports Strategic Intelligence and Analysis Cell (SIAC) for the Office of the Under Secretary of Defense, Research and Engineering (OUSD(R&E)) with assessments and analysis to inform the strategic direction of research, development, and acquisition of innovative capabilities to meet the emerging threats from the diverse range of state and non-state actors confronting the Unites States. Previously, the Technology Watch / Horizon Scan program was aligned under PE 0602234D8Z P525 (Office of Technical Intelligence). In FY 2021, this project has been administratively realigned after the reorganization of the Under Secretary of Defense for Acquisition, Technology, and Logistics, but the scope of work and relative funding remains unchanged. The analysis performed in the PE uses the operational context of Joint and cross-domain missions by leveraging Combatant Commands (COCOM) and Joint Staff warfighting concepts. Throughout this process the analysis will be tightly coupled with both the Intelligence community and the operational community through the Joint Staff. Global science and technology (S&T) awareness and context is provided by the Technology Watch / Horizon Scan Program, and combined with the operational and technical analyses, informs DoD technology, engineering, and acquisition planning to inform the strategic capability development decisions of the OUSD(R&E).

Analysis and assessments are focused on challenges related to the National Defense Strategy (NDS) objectives and adversary research and development trends. Three analysis methods are used: 1) Operational and Technical Assessments identify gaps and options to fill those gaps; 2) Technical Analysis quantifies key attributes of the challenge, assesses counter technology options, and provides an operational value assessment; and 3) the Quick Reaction Analysis Team provides quick turn analysis on emerging challenges and senior leader issues using the Federally Funded Research and Development Center/University Affiliated Research Center (FFRDC/UARC) community as performers while leveraging previous related experience and work done for the Department of Defense (DoD). Due to the complexity of these challenges, the process for developing and executing analytic assessments can span fiscal years and may have multiple phases. Analytic tools are developed and used to identify and track investment data to identify promising areas of capability development.

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603288D8Z / *Science and Technology (S&T) Analytic Assessments* |

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 18.430 | 19.429 | 19.661 | 0.000 | 19.661 |
| Current President's Budget | 17.768 | 18.429 | 23.775 | 0.000 | 23.775 |
| Total Adjustments | -0.662 | -1.000 | 4.114 | 0.000 | 4.114 |
| • Congressional General Reductions | - | -1.000 | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | -0.659 | - | | | |
| • Other Adjustments | -0.003 | - | -0.030 | - | -0.030 |
| • Internal Realignment | - | - | 10.095 | - | 10.095 |
| • Reduction for Defense Wide Review | - | - | -5.951 | - | -5.951 |

**Change Summary Explanation**

In FY 2020, the $1.000 million Congressional reduction was for underexecution.

In FY 2021, internal realignments include a transfer of funds from PE 0602234D8Z Project code 535 (Technical Intelligence) to the Technology Watch/Horizon Scan efforts under Project code 177. This project has been administratively realigned after the reorganization of the Under Secretary of Defense for Acquisition, Technology, and Logistics, but the scope of work remains unchanged.

Defense-Wide Review: The FY 2021 funding request was reduced by $5.951 million during DWR to realign funds for higher priority DoD missions.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 3 | R-1 Program Element (Number/Name)<br>PE 0603288D8Z / *Science and Technology (S&T) Analytic Assessments* | Project (Number/Name)<br>328 / *Science and Technology Analytic Assessments* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 328: *Science and Technology Analytic Assessments* | 51.705 | 17.768 | 18.429 | 17.030 | - | 17.030 | 17.259 | 16.245 | 16.607 | 16.892 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

The Science and Technology (S&T) Analytic Assessments Program Element (PE) directly shapes the development of innovative capabilities to meet the emerging threats from the diverse range of state and non-state actors as outlined in the 2018 National Defense Strategy. These areas include: space and terrestrial-based indications and warnings systems, integrated and resilient Intelligence, Surveillance, Reconnaissance (ISR) platforms, long-range precision strike weapons, missile defense technologies, undersea systems, remotely operated vehicles and technologies, special operations forces, the Cyber Mission Force, ground systems, and other technologies related to the NDS Modernization Priorities. Due to the complexity of these challenges, the process for developing and executing these analytic assessments span fiscal years and may have multiple phases. The emerging nature of the problem sets makes specific identification of all the study projects beyond the budget year unlikely. Implementation of this process spans multiple years causing the portfolio to cascade from year-to-year.

Operational and Technical Assessments are informed by comprehensive Kill Chain Analysis (KCA) across all domains and the time continuum from 2020-2040 to identify prioritized operational issues and associated actionable technology focus areas. These products support detailed analyses and assessments to help shape technology investment decisions and inform the strategic direction of capability development. Because of the 20 year timeframe, these analyses will also help to inform requirements rather than waiting for current processes to develop them. Main lines of effort include the following activities:
-Conduct KCA across NDS Scenarios and other relevant DoD Vignettes to identify and characterize capability disadvantages and opportunities across the battlespace.
-Conduct analysis on operational challenges, and existing and emerging capabilities to assess options that address those challenges within the NDS Scenarios.
-Produce operational impact assessments of potential technology improvements to military capabilities in the near, mid, and far term.
-Produce standardized technology-focused timelines to summarize and track DoD progress toward technical dominance in each of the NDS technology modernization areas.

Technical Analysis and Quick Reaction Analysis Team perform engineering level systems analysis using the DoD sponsored FFRDC/UARC and Department of Defense and Department of Energy (DoD/DoE) laboratories. Using these research performers, previously sponsored research on relevant topics is leveraged in the new research providing value and experience on new projects. Main lines of effort include the following activities:
-Technical threat assessments building on intelligence community products for identifying gaps in U.S. capability for critical threats.
-Quantitative analysis of potential new technology and concepts to address capability gaps and counter emerging threat technologies.
-Independent assessment of critical capability and technology development.

Analytic Tools include modeling, simulation, and analysis (MS&A), computer based engineering models, to confirm theoretical performance of technical concepts. Main lines of effort include the following activities:
-Develop analytic tools to inform and provide decision support to resourcing recommendations.
-Develop strategic analytic tools enabling the analysis and evaluation of critical capability and technology development.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603288D8Z / *Science and Technology (S&T) Analytic Assessments* | **Project (Number/Name)**<br>328 / *Science and Technology Analytic Assessments* |

-Integrated MS&A leveraging Service- and Agency–level virtual and constructive resources to provide insight into complex acquisition and operational decisions.

Red Teaming existing and planned U.S. capabilities and weapons systems using emerging threat systems and capabilities in emerging scenarios.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| ***Title:*** Science and Technology Analytic Assessments | 17.768 | 18.429 | 17.030 | - | 17.030 |

***Description:*** Science and Technology (S&T) Analytic Assessments Program Element (PE) directly supports the development of innovative capabilities to meet the emerging threats from the diverse range of state and non-state actors confronting the Unites States. These capabilities support the objective in the 2018 National Defense Strategy and include: space and terrestrial-based indications and warnings systems, integrated and resilient Intelligence, Surveillance, Reconnaissance (ISR) platforms, strategic lift, long-range precision strike weapons, missile defense technologies, undersea systems, remotely operated vehicles and technologies, special operations forces, the Cyber Mission Force, ground systems, and others outlined in the 2018 National Military Strategy. Throughout this process the analysis will be tightly coupled with both the Intelligence community and the operational community through the Combatant Commands.

Accordingly, the following activities are planned for FY 2020 and FY 2021:

***FY 2020 Plans:***
Operational and Technical Assessments:
Specific tasks that will be executed within the Kill Chain Analysis (KCA) area include:
-Conduct KCA on new threat scenarios and projected threat capabilities.
-Assess emerging operational scenarios against future red and blue capability timelines.
-Update existing KCA based on emerging red and blue capability assessments.
-Develop technology development road maps conveying a comprehensive picture of U.S. technology development in support of the NDS Modernization Priorities
-Compare red and blue technology maturation efforts to highlight efforts that may lead to capability development asymmetries.

Quick Reaction Analysis Team (QRAT):
Quick Reaction Analytic efforts respond to critical questions related to potential vulnerabilities in current and future U.S. systems to identify opportunities or challenges related to developing foreign capabilities. These short analyses focus on emerging technology areas, emerging threat capability development, U.S. requirements to meet challenges and topical questions from USD(R&E) senior leadership.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603288D8Z / *Science and Technology (S&T) Analytic Assessments* | **Project (Number/Name)**<br>328 / *Science and Technology Analytic Assessments* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Technical Analysis:<br>Strategic analyses are 6-12 month engineering level systems analysis. Strategic analyses parametrically define the emerging threat space, determine feasibility of potential solutions and parametrically analyze the solution trade space. Specific tasks that will be executed within the strategic analyses area include:<br>-Explore the feasibility and trade space options for Joint, fully networked command control and communications capabilities across domains.<br>-Identify the early applications for artificial intelligence and autonomous systems to address national defense challenges.<br>-Explore the feasibility and trade space options for countering adversary's emerging intelligence, surveillance and reconnaissance capabilities.<br>-Explore feasibility and potential early applications of directed energy for offensive and defense capabilities.<br><br>Analytic tool development<br>-Develop analytic tools to inform and evaluate new technologies' potential to counter emerging threats and exploit adversary vulnerabilities from air, land, sea, and space domains.<br>-Develop analytic tools to inform decision support and resourcing recommendations.<br>-Develop integrated modeling, simulation, and analysis tools to aid complex acquisition decisions.<br><br>Red Team U.S. capabilities and systems in the context of emerging threats in relevant scenarios. | | | | | |
| ***FY 2021 Base Plans:***<br>Operational and Technical Assessments:<br>Specific tasks that will be executed within the Kill Chain Analysis (KCA) area include:<br>-Conduct KCA on new threat scenarios and projected threat capabilities.<br>-Assess emerging operational scenarios against future red and blue capability timelines.<br>-Update existing KCA based on emerging red and blue capability assessments.<br>-Develop technology development road maps conveying a comprehensive picture of U.S. technology development in support of the NDS Modernization Priorities<br>-Compare red and blue technology maturation efforts to highlight efforts that may lead to capability development asymmetries.<br><br>Quick Reaction Analysis Team (QRAT): | | | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603288D8Z / *Science and Technology (S&T) Analytic Assessments* | **Project (Number/Name)**<br>328 / *Science and Technology Analytic Assessments* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Quick Reaction Analytic efforts respond to critical questions related to potential vulnerabilities in current and future U.S. systems to identify opportunities or challenges related to developing foreign capabilities. These short analyses focus on emerging technology areas, emerging threat capability development, U.S. requirements to meet challenges and topical questions from USD(R&E) senior leadership.<br><br>Technical Analysis:<br>Strategic analyses are 6-12 month engineering level systems analysis. Strategic analyses parametrically define the emerging threat space, determine feasibility of potential solutions and parametrically analyze the solution trade space. Specific tasks that will be executed within the strategic analyses area include:<br>-Explore the feasibility and trade space options for Joint, fully networked command control and communications capabilities across domains.<br>-Identify the early applications for artificial intelligence and autonomous systems to address national defense challenges.<br>-Explore the feasibility and trade space options for countering adversary's emerging intelligence, surveillance and reconnaissance capabilities.<br>-Explore feasibility and potential early applications of directed energy for offensive and defense capabilities.<br><br>Analytic tool development<br>-Develop analytic tools to inform and evaluate new technologies' potential to counter emerging threats and exploit adversary vulnerabilities from air, land, sea, and space domains.<br>-Develop analytic tools to inform decision support and resourcing recommendations.<br>-Develop integrated modeling, simulation, and analysis tools to aid complex acquisition decisions.<br><br>Red Team U.S. capabilities and systems in the context of emerging threats in relevant scenarios.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Inflation Adjustment. The remaining increase is to fund the continued development and implementation of an Integrated Joint Modeling and Simulation capability, using Service and DIA-validated models, available across the Department. | | | | | |
| **Accomplishments/Planned Programs Subtotals** | 17.768 | 18.429 | 17.030 | - | 17.030 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603288D8Z / *Science and Technology (S&T) Analytic Assessments* | **Project (Number/Name)**<br>328 / *Science and Technology Analytic Assessments* |

**C. Other Program Funding Summary ($ in Millions)**

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 3 | R-1 Program Element (Number/Name)<br>PE 0603288D8Z / *Science and Technology (S&T) Analytic Assessments* | Project (Number/Name)<br>177 / *Technology Watch/Horizon Scanning* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 177: *Technology Watch/Horizon Scanning* | - | 0.000 | 0.000 | 6.745 | - | 6.745 | 7.094 | 7.316 | 7.588 | 7.834 | Continuing | Continuing |

**Note**

This program is not a new start. The Technology Watch / Horizon Scan efforts were previously aligned under PE 0602234D8Z P535 (Office of Technical Intelligence). This project has been administratively realigned after the reorganization of the Under Secretary of Defense for Acquisition, Technology, and Logistics, but the scope of work and relative funding remains unchanged.

**A. Mission Description and Budget Item Justification**

The Technology Watch/Horizon Scan Program supports strategic intelligence analysis by providing global science and technology (S&T) awareness and context in order to inform Defense technology, engineering & acquisition planning for decision-makers in an uncertain future. The primary objectives are to 1) Identify and contextualize emerging disruptive technologies (EDT) for the Department of Defense and its senior leadership; and 2) Track global technology trends that challenge fundamental assumptions underpinning current operations and shaping the future of war.

Leveraging technology watch and horizon scanning (TW/HS) capabilities and scouting areas of global technology development, the program's end-state is to inform the Department's senior leadership on where best to invest resources in technology areas to maintain or regain global competitive advantage. The program complements this with tailored technical assessments that identify the military relevance, research opportunities, and policy recommendations for emerging and disruptive technologies.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| ***Title:*** Technology Watch / Horizon Scan | 0.000 | 0.000 | 6.745 | 0.000 | 6.745 |
| ***Description:*** The program exploits novel TW/HS capabilities to identify nascent and disruptive technologies that will shape tomorrow's future by integrating intelligence-based and open-source information to characterize today's global S&T environment, this characterization, in combination with other technical analysis, will inform strategic decisions for capability development. | | | | | |
| ***FY 2020 Plans:***<br>N/A | | | | | |
| ***FY 2021 Base Plans:*** | | | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603288D8Z / *Science and Technology (S&T) Analytic Assessments* | **Project (Number/Name)**<br>177 / *Technology Watch/Horizon Scanning* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| In FY 2021, the TW/HS program will continue to conduct efforts to achieve its primary objectives: 1) Identify and contextualize EDT for senior leadership; and 2) Track global technology trends that challenge fundamental assumptions underpinning current operations and shaping the future of war. Specifically:<br><br>TW/HS Tool Exploitation: Continue to operate and improve the TW/HS capabilities. The activities include: ability to operate and improve data analytics tool; ability to conduct two technology Horizon Scans a year; and, ability to analyze financial data from public, private, and venture capital sources to identify where both U.S. and foreign industries are investing resources in promising areas of capability development.<br><br>TW/HS Analytic Support: Continue to provide analytical and programmatic support to the TW/HS program. The activities include: develop strategies, plans and policies to execute and manage TW/HS Tool Exploitation effort; conduct technology analyses and technology scouting to support the TW/HS program mission; and, produce technical reports and informational white papers, using TW/HS capabilities, to identify and track global technology trends to support the TW/HS program mission. Analytic support will provide a bridge between the intelligence community (IC) and the S&T community to access the most relevant intelligence analysis, coordinate integration of intelligence with capability development, and conduct Red Cell assessments to inform technology investment shaping and strategic direction. An additional function will be to produce an annual S&T Intelligence Needs Plan providing the IC a formal understanding of intelligence requirements for the R&D community.<br><br>***FY 2021 OCO Plans:***<br>N/A<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funds re-aligned from PE 0602234D8Z Project 535 in FY 2021. | | | | | |
| **Accomplishments/Planned Programs Subtotals** | 0.000 | 0.000 | 6.745 | 0.000 | 6.745 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

N/A

**D. Acquisition Strategy**

N/A

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603289D8Z *I Advanced Innovative Analysis and Concepts* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 190.075 | 36.344 | 37.645 | 36.524 | - | 36.524 | 37.788 | 37.712 | 38.677 | 39.497 | Continuing | Continuing |
| 329: *Advanced Innovative Analysis and Concepts* | 190.075 | 36.344 | 37.645 | 36.524 | - | 36.524 | 37.788 | 37.712 | 38.677 | 39.497 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

The Strategic Capabilities Office (SCO) supports the National Defense Strategy by accelerating the development, demonstration, and transition of capabilities that increase the lethality of the Joint Force in contested environments. In a partnership endeavor across the Office of the Secretary of Defense (OSD), Joint Staff, Combatant Commands (CCMDs), the Services, the Intelligence Community (IC), and other U.S. Government agencies, SCO combines capability innovation with new concepts for warfighting that leverage new technology areas, including autonomy, artificial intelligence, and machine learning. SCO conducts projects on accelerated timelines, in all warfighting domains, at any classification or access level.

The Advanced Innovative Analysis and Concepts Program Element supports development, studies, analysis, and demonstration of integrated concepts and prototypes, analysis in support of ongoing efforts to shape and counter emerging threats, cross-Service and cross-Defense/Intelligence concepts, and red-teaming. Projects focus on proving component and subsystem maturity prior to integration in major systems, and may involve risk reduction initiatives. Due to the nature of these projects, specific applications and detailed plans are available at a higher classification level.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 37.178 | 37.645 | 38.478 | - | 38.478 |
| Current President's Budget | 36.344 | 37.645 | 36.524 | - | 36.524 |
| Total Adjustments | -0.834 | 0.000 | -1.954 | - | -1.954 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | -0.006 | - | | | |
| • SBIR/STTR Transfer | -0.828 | - | | | |
| • Defense-Wide Review Adjustment (Studies) | - | - | -1.602 | - | -1.602 |
| • Economic Assumption Reduction | - | - | -0.037 | - | -0.037 |
| • Fiscal Guidance Reduction | - | - | -0.315 | - | -0.315 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 3 | R-1 Program Element (Number/Name)<br>PE 0603289D8Z / *Advanced Innovative Analysis and Concepts* | Project (Number/Name)<br>329 / *Advanced Innovative Analysis and Concepts* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 329: *Advanced Innovative Analysis and Concepts* | 190.075 | 36.344 | 37.645 | 36.524 | - | 36.524 | 37.788 | 37.712 | 38.677 | 39.497 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

The Strategic Capabilities Office (SCO) conducts analysis in support of ongoing efforts to shape and counter emerging threats, with special emphasis on: innovative and architecture-level concepts, cross-Service and cross-Defense/Intelligence concepts, red-teaming, and on a case-by-case basis, research and development projects to demonstrate concept. SCO identifies, analyzes, and accelerates the development, demonstration, and transition of selected capabilities to shape and counter emerging threats, and to improve U.S. security posture. In a partnership endeavor across the Office of the Secretary of Defense (OSD), Joint Staff, Combatant Commands (CCMDs), the Services, the Intelligence Community (IC), and other U.S. Government agencies, SCO combines capability innovation with concepts of operation and information management to develop novel, high-leverage approaches to address pressing national security challenges. SCO conducts projects on accelerated timelines, at any classification or access level.

The Advanced Innovative Analysis and Concepts Program Element supports development, studies, analysis, and demonstration of integrated concepts and prototypes, analysis in support of ongoing efforts to shape and counter emerging threats, cross-Service and cross-Defense/Intelligence concepts, and red-teaming. Projects focus on proving component and subsystem maturity prior to integration in major systems, and may involve risk reduction initiatives. Due to the nature of these projects, specific applications and detailed plans are available at a higher classification level.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** High-Fidelity Analysis and Concept Generation | 21.719 | 21.465 | 20.301 |
| ***Description:*** The Strategic Capabilities Office (SCO) conducts analysis to identify and accelerate the development, demonstration, and transition of potentially game-changing capabilities to shape and counter emerging threats and improve U.S. security posture. All innovative concepts developed within SCO must first undergo a phase of thorough analysis before moving forward to become a project. Due to the nature of these projects, specific applications and detailed plans are available at a higher classification level. | | | |
| ***FY 2020 Plans:***<br>Continue to innovate in partnership with Services Program Offices and CCMDs to identify game-changing uses of existing systems and technologies. | | | |
| ***FY 2021 Plans:***<br>Continue to innovate in partnership with Services Program Offices and CCMDs to identify game-changing uses of existing systems and technologies. | | | |
| ***FY 2020 to FY 2021 Increase/Decrease Statement:*** | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603289D8Z / *Advanced Innovative Analysis and Concepts* | **Project (Number/Name)**<br>329 / *Advanced Innovative Analysis and Concepts* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| FY 2020 to FY 2021 decrease is due to Defense-Wide Review decisions that reduced studies. | | | |
| ***Title:*** Quick Win Projects | 14.625 | 16.180 | 16.223 |
| ***Description:*** The Strategic Capabilities Office (SCO) pursues rapid research and development projects and prototyping to deliver new capabilities to the warfighter swiftly (2 years or less), called a "Quick Win." For "Quick Wins," SCO identifies, analyzes, and accelerates the development, demonstration, and transition of selected capabilities to shape and counter emerging threats, and to improve U.S. security posture. Projects focus on proving component and subsystem maturity prior to integration in major systems, and may involve risk reduction initiatives. Due to the nature of these projects, specific applications and detailed plans are available at a higher classification level.<br><br>***FY 2020 Plans:***<br>Complete FY 2019 Quick Win projects, start FY 2020 Quick Win projects.<br><br>***FY 2021 Plans:***<br>Complete FY 2020 Quick Win projects, start FY 2021 Quick Win projects.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>FY 2020 to FY 2021 increase is the result of minor rate adjustments. | | | |
| **Accomplishments/Planned Programs Subtotals** | 36.344 | 37.645 | 36.524 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603291D8Z / *Advanced Innovative Analysis & Concepts - MHA* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 14.970 | 13.286 | 14.668 | 14.703 | - | 14.703 | 14.209 | 14.782 | 15.146 | 15.454 | Continuing | Continuing |
| 251: *SCO Operational Costs* | 14.970 | 13.286 | 14.668 | 14.703 | - | 14.703 | 14.209 | 14.782 | 15.146 | 15.454 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

The Strategic Capabilities Office (SCO) conducts analysis to identify and accelerate the development, demonstration, and transition of potentially game-changing capabilities to shape and counter emerging threats and improve U.S. security posture. This funding line was established in FY 2018 from transferred funds from PE 0603289D8Z / Advanced Innovative Analysis and Concepts, to be used for MHA related endeavors. In a partnership endeavor across the Office of the Secretary of Defense (OSD), Joint Staff, Combatant Commands (CCMDs), the Services, the Intelligence Community (IC), and other U.S. Government agencies, SCO combines capability innovation with new concepts for warfighting that leverage new technology areas, including autonomy, artificial intelligence, and machine learning. SCO conducts projects on accelerated timelines, in all warfighting domains, at any classification or access level.

The Advanced Innovative Analysis and Concepts -MHA Program Element supports development, studies, analysis, and demonstration of integrated concepts and prototypes, analysis in support of ongoing efforts to shape and counter emerging threats, cross-Service and cross-Defense/Intelligence concepts, and red-teaming. Projects focus on proving component and subsystem maturity prior to integration in major systems, and may involve risk reduction initiatives. Due to the nature of these projects, specific applications and detailed plans are available at a higher classification level.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 13.590 | 14.668 | 14.839 | - | 14.839 |
| Current President's Budget | 13.286 | 14.668 | 14.703 | - | 14.703 |
| Total Adjustments | -0.304 | 0.000 | -0.136 | - | -0.136 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | -0.002 | - | | | |
| • SBIR/STTR Transfer | -0.302 | - | | | |
| • Fiscal Guidance Reduction | - | - | -0.122 | - | -0.122 |
| • Economic Assumption Reduction | - | - | -0.014 | - | -0.014 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 3 | R-1 Program Element (Number/Name)<br>PE 0603291D8Z / *Advanced Innovative Analysis & Concepts - MHA* | Project (Number/Name)<br>251 / *SCO Operational Costs* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 251: *SCO Operational Costs* | 14.970 | 13.286 | 14.668 | 14.703 | - | 14.703 | 14.209 | 14.782 | 15.146 | 15.454 | Continuing | Continuing |

**Note**

PE 0603291D8Z Advanced Innovative Analysis & Concepts - MHA, which is not a new program was established in FY 2018 from transferred funds from PE 0603289D8Z / Advanced Innovative Analysis and Concepts.

**A. Mission Description and Budget Item Justification**

The Strategic Capabilities Office (SCO) conducts analysis to identify and accelerate the development, demonstration, and transition of potentially game-changing capabilities to shape and counter emerging threats and improve U.S. security posture. This funding line was established in FY 2018 from transferred funds from PE 0603289D8Z / Advanced Innovative Analysis and Concepts for MHA endeavors.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** SCO Operational Costs - MHA | 13.286 | 14.668 | 14.703 |
| ***Description:*** The Strategic Capabilities Office (SCO) conducts analysis to identify and accelerate the development, demonstration, and transition of potentially game-changing capabilities to shape and counter emerging threats and improve U.S. security posture. This funding line which is not a new program was established in FY 2018 from transferred funds from PE 0603289D8Z / Advanced Innovative Analysis and Concepts for MHA related endeavors.<br><br>***FY 2020 Plans:***<br>The Strategic Capabilities Office will utilize this funding for MHA related endeavors which will enable continued analysis, development, demonstration, and transition of capabilities to counter emerging threats and improve U.S. security posture.<br><br>***FY 2021 Plans:***<br>The Strategic Capabilities Office will utilize this funding for MHA related endeavors which will enable continued analysis, development, demonstration, and transition of capabilities to counter emerging threats and improve U.S. security posture.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Increase of $.035M from FY 2020 to FY 2021 budget numbers is due to minor program adjustments. | | | |
| **Accomplishments/Planned Programs Subtotals** | 13.286 | 14.668 | 14.703 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603291D8Z / *Advanced Innovative Analysis & Concepts - MHA* | **Project (Number/Name)**<br>251 / *SCO Operational Costs* |

**C. Other Program Funding Summary ($ in Millions)**

**Remarks**

PE 0603291D8Z Advanced Innovative Analysis & Concepts - MHA was established in FY 2018 from transferred funds from PE 0603289D8Z / Advanced Innovative Analysis and Concepts.

**D. Acquisition Strategy**

N/A

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603291D8Z / *Advanced Innovative Analysis & Concepts - MHA* | **Project (Number/Name)**<br>251 / *SCO Operational Costs* |

**Remarks**

Management Headquarters Activities - MHA's that are funded under the Advanced Innovative Analysis & Concepts.

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603338D8Z / *Defense Modernization and Prototyping* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 0.000 | 0.000 | 0.000 | 133.375 | - | 133.375 | 133.107 | 134.480 | 132.992 | 135.981 | Continuing | Continuing |
| 720: *Quick Reaction Special Projects (QRSP)* | - | 0.000 | 0.000 | 49.023 | - | 49.023 | 50.269 | 50.755 | 47.137 | 48.377 | Continuing | Continuing |
| 721: *Emerging Capabilities Tech Dev (ECTD)* | - | 0.000 | 0.000 | 64.650 | - | 64.650 | 66.014 | 66.933 | 67.856 | 69.238 | Continuing | Continuing |
| 722: *Time Sensitive Targeting Defeat (TSTD)* | - | 0.000 | 0.000 | 9.816 | - | 9.816 | 6.897 | 6.881 | 7.058 | 7.202 | Continuing | Continuing |
| 723: *Red Teaming (RT)* | - | 0.000 | 0.000 | 9.886 | - | 9.886 | 9.927 | 9.911 | 10.941 | 11.164 | Continuing | Continuing |

**Note**

Program Element (PE) 0603338D8Z Defense Modernization and Prototyping (DM&P) is a new PE in FY 2021. This PE consolidates all funding and project investment areas previously supported by PE 0603699D8Z Emerging Capabilities Technology Development (ECTD), PE 0603826D8Z Quick Reaction Special Projects (QRSP), and PE 0604132D8Z Missile Defeat Project. DM&P provides the funding focus and visibility for USD(R&E) to select projects critical for DOD modernization, and initiate them in the year of execution, thereby accelerating the delivery of joint mission capabilities to the warfighter and ensuring technical overmatch in peer engagements.

**A. Mission Description and Budget Item Justification**

In alignment with the National Defense Strategy, the Defense Modernization and Prototyping (DM&P) Program Element (PE) supports the Under Secretary of Defense for Research and Engineering (USD(R&E)) with innovation-focused experimentation and prototyping to deliver joint mission capabilities to the warfighter at the speed of relevance. DM&P's mission-focused capabilities cross functional domains and enhance warfighter lethality, technical superiority, adaptability, and resilience. DM&P funding supports joint prototype development, joint experimentation for concept of operations (CONOPs) development, and red teaming validations that enable disruptive innovation to sustain the United States' operational superiority. The DM&P PE enables the USD(R&E) vision for next generation platforms, weapons systems, fire control, sensors, logistics, and communications. The consolidated nature of the DM&P PE increases the Department's ability to coordinate activities across the Services, Defense Agencies, and international partners; provides the agility to rapidly pivot to new threats; and, supplies the resources necessary to ensure a technological overmatch against future threats. This realignment directly supports the Department's modernization plans by streamlining investments, reducing the time from discovery to deployment, and enabling development of disruptive technologies to help realize the National Defense Strategy.

DM&P prototyping projects increase the speed of technology innovation by reducing technology risk for capabilities addressing modernization challenges. With an emphasis on joint and interagency partnerships, DM&P matures capability options to anticipate and inform new acquisition pathways in addition to formal requirements and acquisition processes. Project selection is guided by Department-level strategies and priorities, such as the Department of Defense (DoD) modernization priorities, National Defense Strategy, the Chairman's Capability Gap Assessment, and the Combatant Commands' Integrated Priority Lists (IPLs). The DM&P PE supports four major project codes that expedite development and transition of new joint mission capabilities to the warfighter. These project codes are: 1) Emerging Capability Technology Development (ECTD), 2) Quick Reaction Special Projects (QRSP), 3) Red Teaming, and 4) Time Sensitive Target Defeat (TSTD). Completed DM&P

projects transition to joint programs through fielded operationally relevant prototypes; technology adoption into programs of record; integration into system level, multi-year joint demonstrations; and through advanced research and engineering efforts like the Warfighting Lab Incentive Fund for further development of tactics, techniques, procedures, and concepts of operations.

The DM&P PE will continue to leverage the year of execution processes that enabled ECTD and QRSP to quickly and effectively respond to emergent innovation opportunities through the rapid development and transition of risk reducing prototypes. DM&P prototyping activities include initial concept discovery of potentially game-changing capabilities through relatively low cost risk reducing prototypes; and, high-fidelity prototyping of advanced systems in partnership with the Services, Defense Agencies, and allies to inform the acquisition of new joint mission capabilities though experimentation and red teaming.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 0.000 | 0.000 | 0.000 | - | 0.000 |
| Current President's Budget | 0.000 | 0.000 | 133.375 | - | 133.375 |
| Total Adjustments | 0.000 | 0.000 | 133.375 | - | 133.375 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | - | - | | | |
| • Transfer from Legacy RDT&E Program Elements | - | - | 134.009 | - | 134.009 |
| • Other Adjustments and DoD Priorities | - | - | -0.502 | - | -0.502 |
| • Economic Adjustments | - | - | -0.132 | - | -0.132 |

**Change Summary Explanation**

The adjustment of $134.009 million reflects the transfer of all funding and project investment areas previously supported by PE 0603699D8Z Emerging Capabilities Technology Development (ECTD), PE 0603826D8Z Quick Reaction Special Projects (QRSP), and PE 0604132D8Z Missile Defeat Project. The transfer of these resources is to provide transparency, alignment and focus supporting development of key technologies and modernization with OUSD(R&E) identified capability thrust priorities.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 3 | R-1 Program Element (Number/Name)<br>PE 0603338D8Z / *Defense Modernization and Prototyping* | Project (Number/Name)<br>720 / *Quick Reaction Special Projects (QRSP)* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 720: *Quick Reaction Special Projects (QRSP)* | - | 0.000 | 0.000 | 49.023 | - | 49.023 | 50.269 | 50.755 | 47.137 | 48.377 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

Quick Reaction Special Projects (QRSP) funds the development of risk-reducing prototypes, experiments, and demonstrations to expedite delivery of effective, affordable, and critically needed joint mission capabilities to the warfighter. These lower-cost prototypes and QRSP's innovative business processes give the Under Secretary of Defense for Research and Engineering (USD(R&E)) the agility to quickly explore new, higher-risk technology areas that have the potential for immediate, game-changing impacts. Developed prototypes inform modernization efforts or transition through rapid technology refresh and insertion into joint mission capabilities. QRSP also enables the DoD to identify innovated solutions from small and non-traditional business not normally engaged by the DoD to address gaps and augment joint mission capabilities. Project selection is guided by department-level strategies and priorities, such as the DoD's modernization areas and the National Defense Strategy. Needs are identified and prototype projects are funded within the year of execution to demonstrate the feasibility of new technologies, enable integration into larger systems, and deliver affordable capabilities faster than standard acquisition cycles. With an emphasis on joint and interagency partnerships, QRSP matures capability options to anticipate and inform new acquisition pathways in addition to formal requirements and acquisition processes.

QRSP includes thrust areas that complement risk-reducing prototypes, such as Strategic Multi-layer Assessments (SMA) and joint demonstrations and experiments. SMA supports senior leadership in the Combatant Commands (CCMDs) by providing rapid, actionable assessments of complex operational and technical challenges. Joint demonstrations and DM&P-sponsored venues of defense-wide experiments provide opportunities for emerging technologies to succeed, or fail fast. Demonstration venues include: Stiletto, a maritime experimentation and demonstration platform; Thunderstorm, a multi-domain venue focused on innovative small and non-traditional businesses; and, other tailored experimentation and demonstration events. Individual projects generally span 6 to 18 months, typically at a cost of less than $1.000 million.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Autonomy at the Tactical Edge Focus Area | 0.000 | - | 4.843 |
| ***Description:*** This focus area explores joint mission capabilities to enhance the lethality of the joint force, reduce the time to make critical decisions, autonomously distribute tasking and orders, and protect warfighters through increased use of intelligent networks, autonomous sensing platforms, and human-machine collaborative systems. Selected projects target key capabilities that enable leap-ahead improvements and intelligent autonomous systems with cost effective investments. These projects leverage advances in high performance computing, autonomy, and machine learning to transfer cognitive burden closer to the point of collection and action. Examples include agile computer vision systems, enhanced capabilities for multiple autonomous systems to cooperatively interact, tools to fuse and infer information from a wide variety of sensors and datasets, autonomous task discrimination and prioritization, autonomous operation in complex terrain, collaborative systems for efficient distribution of contested logistics, data preprocessing to reduce bandwidth requirements for fully integrated command and control, and | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603338D8Z / *Defense Modernization and Prototyping* | **Project (Number/Name)**<br>720 / *Quick Reaction Special Projects (QRSP)* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| human-machine collaborative decision making providing faster-than-human response to threats. These projects will also examine common software platforms and modular open architecture systems to reduce development cost, increase collaboration among manned and unmanned platforms, and inform requirements.<br><br>***FY 2021 Plans:***<br>QRSP investment decisions are made during the execution years in response to DoD, CCMD, Service, and other government priorities. QRSP anticipates supporting three to seven projects in FY 2021.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Program element 0603338D8Z Defense Modernization and Prototyping is a new funding line for FY 2021. | | | |
| ***Title:*** Targeted Prototyping for Increased Lethality and Survivability Focus Area<br><br>***Description:*** This focus area leverages opportunities for collaboration to rapidly mature and demonstrate advanced weapon systems through targeted prototyping of key enabling technologies. Selected projects extend Service and defense agency investments to demonstrate joint mission capabilities through coordination with U.S. Special Operations Command (USSOCOM), Defense Innovation Unit (DIU), Rapid Capability Offices, Rapid Equipping Force, warfighter laboratories and other organizations that seek to refine future capabilities through near-term operational concepts. Example projects include dynamic data links for re-tasking and coordination of small munitions; new propellant formulations for extended range fire support; advanced materials to increase weapon system survivability; novel warhead designs to increase lethality; and low cost, extended range, swarming, loitering munitions. Through co-funding and invested transition partners, developed concepts will be rapidly deployed to assess utility and inform concepts of operation prior to initial operation and informing future acquisition programs.<br><br>***FY 2021 Plans:***<br>QRSP investment decisions are made during the execution years in response to DoD, CCMD, Service, and other government priorities. QRSP anticipates supporting seven to twelve projects in FY 2021.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Program element 0603338D8Z Defense Modernization and Prototyping is a new funding line for FY 2021. | 0.000 | - | 9.593 |
| ***Title:*** Persistent Intelligence, Surveillance and Reconnaissance (ISR) Focus Area<br><br>***Description:*** ISR sensor networks are critical for providing asymmetric compensation against peer adversaries. Advances in distributed, interconnected sensors with fully networked command, control, and communications provide opportunities for new solutions to anti-access/area denial and persistent surveillance challenges. This focus area helps address emerging needs for persistent ISR capabilities, which provide improved ground, air, sea, and space situational awareness. Projects will address joint mission capability needs through development and experimentation with prototype platforms, sensors and communication | 0.000 | - | 4.847 |

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| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| architectures that explore new or improved methods for robust, ad hoc sensors networks; reliable communications; and collaboratively networked sensors to persistently operate within denied areas.<br><br>***FY 2021 Plans:***<br>QRSP investment decisions are made during the execution years in response to DoD, CCMD, Service, and other government priorities. QRSP anticipates supporting three to seven projects in FY 2021.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Program element 0603338D8Z Defense Modernization and Prototyping is a new funding line for FY 2021. | | | |
| ***Title:*** Realizing Disruptive Technologies for DoD Modernization Focus Area<br><br>***Description:*** This focus area matures key capabilities that augment platforms, weapons, sensors, and other solutions to modernization challenges. Selected projects leverage investment from traditional and non-traditional industry partners; proven commercial and government off the shelf technologies; rapidly maturing technologies within Service laboratories, academia, and Federally Funded Research and Development Centers (FFRDCs); technologies from allied nations; and direct warfighter feedback to identify and address gaps within current and developing capabilities. These targeted investments accelerate capability to the warfighter and realize new disruptive technologies through low cost, rapid opportunities to cyclically innovate within the development process for major system prototypes developed through Strategic Capabilities Office and Defense Innovation Unit, Joint Capability Technology Demonstrations, and Service programs of record. Example projects include novel learning algorithms and next generation computing; adaptation of commercial cyber tools; field demonstrations of quantum sensors; unique applications of active and passive radio frequency architectures; and, early-stage concepts for highly-efficient directed energy subsystems. Project selection will be informed by a joint review process incorporating representatives from Service and Defense Agencies; major prototype, demonstrations, and acquisition programs; DoD and FFRDC subject matter experts; and, USD(R&E) leadership to avoid duplication of efforts and ensure activities address mission critical modernization challenges.<br><br>***FY 2021 Plans:***<br>QRSP investment decisions are made during the execution years in response to DoD, CCMD, Service, and other government priorities. QRSP anticipates supporting seven to twelve projects in FY 2021.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Program element 0603338D8Z Defense Modernization and Prototyping is a new funding line for FY 2021. | 0.000 | - | 9.873 |
| ***Title:*** Distributed, Collaborative, Multi-Function Devices for Electromagnetic Spectrum Agility<br><br>***Description:*** This focus area explores integrated, multi-function, net-centric electromagnetic spectrum (ES) concepts and technologies to enable a multi-domain, flexible, diverse, and interoperable ES architecture. In the modern battlespace, the electromagnetic spectrum is both a contested resource and unique terrain requiring advanced maneuver. Tactics, techniques, | 0.000 | - | 9.867 |

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| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| and procedures are necessary to maintain access to ES and ensure maneuverability. Selected projects provide the architecture to ensure allied access, deny enemy use, and enable future capabilities for ES dominance. Examples include waveform agnostic apertures, amplifiers, and digital signal processing for multi-use systems (radar, communications, electronic warfare, sensing); advanced routing and artificial intelligence task and network routing for increase efficiency; and, ad hoc distributed apertures for collaborative electronic warfare (EW) distributed radar. Activities include refining software and algorithms, novel hardware and electronic components, and advanced timing and networking technologies that directly support emerging common standards for next generation distributed, collaborative, multi-function devices.<br><br>***FY 2021 Plans:***<br>QRSP investment decisions are made during the execution years in response to DoD, CCMD, Service, and other government priorities. QRSP anticipates supporting seven to twelve projects in FY 2021.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Program element 0603338D8Z Defense Modernization and Prototyping is a new funding line for FY 2021. | | | |
| ***Title:*** Multi-domain Experimentation and Demonstration Venues | 0.000 | - | 5.000 |
| ***Description:*** Agile and flexible experimentation and demonstration capabilities and venues support DoD modernization by increasing the rate of innovation through hands-on warfighter demonstrations of joint mission capabilities. Demonstration venues enable Joint Program Offices, Service, and Combatant Command user evaluation of emerging novel technologies in relevant environments. Demonstration venues include the Thunderstorm venue for small and non-traditional businesses; the Stiletto maritime technology platform; and, other tailored multi-domain venues and ad-hoc demonstrations. These experimentation and demonstration venues support the rapid discovery and transition of emerging technologies across the range of military operations. The venues provide the DoD and interagency partners with an opportunity to identify and evaluate new and emerging technologies both from commercial and government sectors through a series of technology demonstrations, experiments, vignettes, and related activities. The venues also offer a streamlined experimentation and demonstration process that encourages system developers to engage directly with the warfighter. These engagements enable rapid innovation and adoption of new technologies to meet operational needs through the exploration of military utility, and identification of potential risks of emerging technologies.<br><br>***FY 2021 Plans:***<br>Multi-domain venues will continue to focus on the most pressing challenges to DoD and provide agile venues to explore new and innovative technological solutions. Focus areas will be based on needs and priorities identified through engagement with stakeholders in the Services, Combatant Commands, Intelligence Community, and other operational users.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:*** | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
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| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603338D8Z / *Defense Modernization and Prototyping* | **Project (Number/Name)**<br>720 / *Quick Reaction Special Projects (QRSP)* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Program element 0603338D8Z Defense Modernization and Prototyping is a new funding line for FY 2021. | | | |
| ***Title:*** Strategic Multi-Layered Assessment (SMA) Reach Back Cell | 0.000 | - | 2.000 |
| ***Description:*** In FY 2021, the SMA Reach Back Cell will transition from PE 0603826D8Z Quick Reaction Special Projects (QRSP). The SMA Cell supports senior leadership in the Combatant Commands (CCMDs) with actionable assessments of complex operational and technical challenges. SMA efforts leverage multi-agency, multi-disciplinary approaches to answer the Combatant Commanders' key strategic questions that are not within the DoD's core competency. The assessments help maintain our competitive advantage in an increasingly complex global environment. The SMA Cell was established by the Joint Staff Deputy Director for Global Operations at the request of the Commander, U.S. Central Command (USCENTCOM). SMA assessments are framed during the year of execution and are in response to specific tasking from senior leadership in the CCMDs. The SMA Cell identifies options from across the U.S. Government, academia, and the private sector. SMA efforts are facilitated by the Joint Chiefs of Staff/J-3 Operations and are executed by the Office of the Under Secretary of Defense, Research and Engineering. The SMA Cell provides USCENTCOM with population-based and regional expertise in support of ongoing operations in the USCENTCOM area of responsibility.<br><br>***FY 2021 Plans:***<br>In FY 2021, the SMA Cell will transition from PE 0603826D8Z Quick Reaction Special Projects (QRSP). The realignment of the SMA Cell will not change the objective of providing support to the CCMDs or influencing acquisition programs resulting from identified needs.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Program element 0603338D8Z Defense Modernization and Prototyping is a new funding line for FY 2021. | | | |
| ***Title:*** Prototyping Through Non-Traditional Pathways | 0.000 | - | 3.000 |
| ***Description:*** Prototyping Through Non-Traditional Pathways leverages technologies and emerging products developed by small, innovative businesses in the commercial sector including information technologies; internet-of-things sensors and adaptive networks; bio-medical advances; emerging quantum applications; and novel microelectronic/microelectromechanical system innovations. Ideas from non-traditional emerging technology companies are matched against DoD, CCMD, Service, and other government priorities. Promising solutions are selected for further test and evaluation and, if successful, rapid prototyping or fielding to transition commercial ideas with military utility. These efforts support the Department's objectives of leveraging commercial innovation to maintain technology superiority; increasing rate of technology maturation; exploring alternative and faster pathways for acquisition; and fielding affordable and effective joint mission capabilities. In FY 2019, Prototyping Through Non-Traditional Pathways conducted reviews focused on priorities of USSOCOM, Joint Improvised-Threat Defeat Organization, cyber community of interest, and Office of the Under Secretary of Defense, Research and Engineering. | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
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| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603338D8Z / *Defense Modernization and Prototyping* | **Project (Number/Name)**<br>720 / *Quick Reaction Special Projects (QRSP)* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***FY 2021 Plans:***<br>Prototyping Through Non-Traditional Pathways anticipates three to five reviews in FY 2021, and 15 to 20 resulting evaluations with potential for future prototypes. Each review focuses on identifying ideas in a specific topic area that can transition to meet joint operational needs through rapid prototyping. These reviews will be executed with DoD users and interagency partners.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Program element 0603338D8Z Defense Modernization and Prototyping is a new funding line for FY 2021. | | | |
| **Accomplishments/Planned Programs Subtotals** | 0.000 | - | 49.023 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Quick Reaction Special Projects (QRSP) will support FY 2021 performance metrics to transition projects to the warfighter and enable DoD modernization capabilities. QRSP is a new project code in 2021 and there is no historic data on transition rates.

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| Appropriation/Budget Activity<br>0400 / 3 | R-1 Program Element (Number/Name)<br>PE 0603338D8Z / *Defense Modernization and Prototyping* | Project (Number/Name)<br>721 / *Emerging Capabilities Tech Dev (ECTD)* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 721: *Emerging Capabilities Tech Dev (ECTD)* | - | 0.000 | 0.000 | 64.650 | - | 64.650 | 66.014 | 66.933 | 67.856 | 69.238 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

Emerging Capabilities Technology Development (ECTD) funding supports the USD(R&E) mission to accelerate the development and fielding of overmatch capabilities to the warfighter in coordination with the Services, Combatant Commands (CCMDs), and Joint Staff. Prototyping and experimentation activities focus on key Defense modernization challenges in mission areas identified by the Joint Staff and USD(R&E) leadership. ECTD leverages rapid prototyping processes to include Broad Agency Announcements (BAA) and Other Transition Authorities (OTA) that seek to demonstrate a novel technology or concept in a relevant environment within a 30-month period then transition it to an operational user. ECTD activities refine future warfighting concepts, inform Service Program of Record (PoR) capability requirements, and provide residual joint mission capability through leave behind test articles.

Anticipated FY 2021 investments areas target the following key mission areas: Advanced Electronic Warfare (EW); Fully Networked Command, Control, and Communication (FNC3); Joint Fires and Targeting; Contested Logistics Operations; and Intelligence, Surveillance, and Reconnaissance (ISR) to support Time-Critical Targeting. Projects will be identified through soliciting concepts from Service, CCMDs, industry, academia, Federally Funded Research & Development Centers (FFRDCs), University Affiliated Research Centers (UARCs), and Department of Defense laboratories. Efforts are designed to encourage teaming between organizations to generate integrated concepts that result in leap-ahead mission capabilities. This process also focuses related Service and Defense Agency projects to a common set of gaps addressing peer engagements. Individual projects generally span one to three years, typically at a cost of less than $15.000 million. ECTD prototypes, demonstrations, and experiments enable developers to showcase new and maturing capabilities in realistic environments and against realistic threats with operational user involvement.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Fully Networked Command, Control, and Communications For Distributed Aerial Systems Focus Area | 0.000 | - | 35.000 |
| ***Description:*** This focus area addresses a Secretary of Defense priority for integrated communications and networking across unmanned aerial systems to deliver system diversity and resilience to the joint warfighter. Projects will provide flexibility and interoperability to ensure the warfighter's connectivity across offensive and defensive systems.<br><br>***FY 2021 Plans:***<br>Fully Networked Command, Control and Communications activities will focus on the following areas of concern: (1) Encourage spectral diversity, allowing for any radio to be used to route any piece of information; (2) Facilitate spatial diversity, enabling networks to use any combination of links to route information; (3) Ensure link resiliency, including nullifying adversarial jamming, | | | |

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| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603338D8Z / *Defense Modernization and Prototyping* | **Project (Number/Name)**<br>721 / *Emerging Capabilities Tech Dev (ECTD)* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| and countering an enemy's employment of unmanned aerial systems and other intelligence, surveillance, and reconnaissance platforms.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Program element 0603338D8Z Defense Modernization and Prototyping is a new funding line for FY 2021. | | | |
| ***Title:*** Electromagnetic Spectrum Dominance Focus Area<br><br>***Description:*** This focus area matures advanced Electronic Warfare (EW) and Electromagnetic Spectrum (EMS) sensing concepts and joint mission capabilities through operationally relevant prototyping activities. Radio frequency (RF) spectrum congestion and emergent peer EW threats erode U.S. capabilities in ways that are difficult to predict and counteract. This focus area helps develop multi-function, frequency agile EMS dominance prototypes by leveraging advances in distributed and multi-purpose apertures, microelectronics, machine learning, and autonomous systems . The end result is an application agnostic architecture that enables a variety of EW applications across Joint Service platforms, which increased survivability and lethality against peer threats. Prototype assessments will occur in realistic venues such as the Silent Hammer Experimentation program to inform new warfighting concepts and requirements for future acquisition programs. Development of advanced prototypes will involve partnerships with industry and academia.<br><br>***FY 2021 Plans:***<br>This focus area will develop concepts and designs through prototyping that will result in next generation EW, and RF sensing capabilities in one to three years. While project determinations are generally made in the year of execution, projects to be considered will identify and analyze EMS threats and provide capabilities that will enable DoD systems to operate effectively in the congested EMS environments at home and those expected in future contingency operations. One to two prototype efforts are anticipated in FY 2021 leveraging Joint, Service, and interagency partnerships.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Program element 0603338D8Z Defense Modernization and Prototyping is a new funding line for FY 2021. | 0.000 | - | 4.916 |
| ***Title:*** Assured Global Command, Control, and Communications Focus Area<br><br>***Description:*** This focus area prototypes innovative technologies to enable experimentation with new Joint Service command and control concepts. In future theaters information will need to flow seamlessly between humans, AI agents, vehicles, autonomous systems, and weapon platforms to provide sufficient flexibility and rapid action that assures technological and operational dominance. Assured response requires resilient and robust networks where every aperture is an interoperable node regardless of Service, platform, or transmission methods. This focus area enables rapid prototyping and transition of key technology components that enable multi-function systems and increases utilization and efficiency across the command, control, and communications architectures. Component technologies that may be prototyped included miniaturized hardware, novel multi- | 0.000 | - | 5.000 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603338D8Z / *Defense Modernization and Prototyping* | **Project (Number/Name)**<br>721 / *Emerging Capabilities Tech Dev (ECTD)* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| purpose apertures, flexible and secure waveforms, common interfaces, and modern techniques. Where possible, identified projects leverage commercial technologies including high bandwidth data links, 5G protocols, advanced software defined radios, and AI enabled network management. Prototype development and demonstration will leverage partnerships with industry, Federally Funded Research and Development Centers, Academia, Service laboratories, and our international partners.<br><br>***FY 2021 Plans:***<br>FY 2021 projects build on current developments and laboratory breakthroughs within industry, Academia, and Service laboratories. Selected prototypes will demonstrate key capabilities for fully networked command, control, and communications in one to three years. While project determinations are generally made in the year of execution, projects to be considered will include novel apertures, waveforms, and microelectronic technologies to provide assured response. One to two prototype efforts are anticipated in FY 2021 leveraging Joint, Service, and interagency partnerships.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Program element 0603338D8Z Defense Modernization and Prototyping is a new funding line for FY 2021. | | | |
| ***Title:*** Prototyping Advanced Capabilities Through Innovative Validation Exercises (PROACTIVE) Focus Area | 0.000 | - | 2.000 |
| ***Description:*** This focus area enables rapid adaption and adoption of prototypes to meet mission needs by integrating end-to-end prototypes into existing large-scale demonstrations and exercises. Selected prototypes will be rapidly integrated into operational demonstrations such as Northern Edge and Valiant Shield to explore tactics, techniques, and procedures, and enhance interoperability among the Services. By allowing warfighters to train with end-to-end system solutions this effort enables concept of operation and concept of employment experimentation, increases the rate of technology adoption, and eliminates the feedback delay for new capabilities. These large-scale exercises also provide increased fidelity, opportunities for validating employment and human factors, and real-world challenges to validate system interoperability and military utility. Featured prototypes will showcase system-of-system solutions to emerging threats. PROACTIVE projects are designed with direct inputs from the Joint Staff, Service science and technology leadership, and leadership within the Combatant Commands. After each event, prototypes will transition to the services for refinement or initial operational fielding.<br><br>***FY 2021 Plans:***<br>In FY 2021, PROACTIVE will integrated one to two prototypes within existing demonstrations or exercises in FY 2021 and FY 2022. Prototype selection and integration occurs early in the exercise planning with flexible pathways for technology insertion. Each event targets a specific set of challenges and results in one or more capability assessments by participating warfighters. Prototype integration activities leverage Joint, Service, interagency partnerships, and allied partner organizations.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:*** | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
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| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603338D8Z / *Defense Modernization and Prototyping* | **Project (Number/Name)**<br>721 / *Emerging Capabilities Tech Dev (ECTD)* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Program element 0603338D8Z Defense Modernization and Prototyping is a new funding line for FY 2021. | | | |
| ***Title:*** Asymmetric Counters to Unconventional Weapons and Missile Threats Focus Area | 0.000 | - | 1.888 |
| ***Description:*** This focus area addresses time-sensitive threats from weapons of mass destruction (WMD) and missile delivery systems through rapidly deployed, resilient concepts and enabling technologies to reduce the kill chain timeline. Projects will leverage advanced networked sensors, autonomous learning systems, and low-cost strike concepts to asymmetrically defeat time-sensitive threats. The focus area is aimed at developing prototype technologies and demonstrations that reduce the kill chain timeline via: (1) Enhanced capabilities to rapidly find, fix, and track WMD and missile threats; (2) Persistent intelligence and target discrimination in anti-access/aerial denial (A2/AD) environments; (3) Adaptable, resilient, strike concepts to promptly engage weapons of mass destruction (WMD) and missile delivery systems.<br><br>***FY 2021 Plans:***<br>FY 2021 projects will be selected in the year of execution to accelerate DoD modernization and address challenges identified in the National Defense Strategy. Selected efforts include cost-effective, mission-focused projects to design, develop, and deliver new concepts and technology prototypes aimed at supporting the Joint Force with critical enablers in distributed networked sensors, unattended intelligence systems, and new joint mission capabilities to address time-sensitive threats. One to three prototype efforts are anticipated in FY 2021 leveraging Joint, Service, and interagency partnerships.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Program element 0603338D8Z Defense Modernization and Prototyping is a new funding line for FY 2021. | | | |
| ***Title:*** Autonomous or Semi-Autonomous systems for Integrated Fires through Human-Machine Combat Teaming Focus Area | 0.000 | - | 11.846 |
| ***Description:*** This focus area addresses the need to develop new operational capabilities, which provide the warfighter and battlefield commander enhanced situational awareness and a common operating picture. By integrating legacy and next generation autonomous or semi-autonomous systems, projects selected in this focus area enable battlefield commanders to: speed up the observe, orient, decide, and act (OODA) loop; reduce warfighter cognitive load; and, increase timely application of appropriate kinetic or non-kinetic responses. The focus area is aimed at rapidly developing prototype technologies and demonstrations of systems to: (1) semi-autonomously detect, identify, track, prioritize, and engage targets with operator determination; (2) autonomously detect, classify threats or threat signals, then recommend defensive or offensive actions to the operator. Prototypes developed in this focus area will be delivered to Joint and Service users to evaluate joint mission capabilities under realistic conditions and against current adversaries or anticipated threats. Development of advanced prototypes will involve partnerships with industry and academia and permit operational users to gain insight into future technology-enabled strategies and tactics.<br><br>***FY 2021 Plans:*** | | | |

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| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603338D8Z / *Defense Modernization and Prototyping* | **Project (Number/Name)**<br>721 / *Emerging Capabilities Tech Dev (ECTD)* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| FY 2021 projects will be selected in the year of execution to accelerate DoD modernization and address challenges identified in the National Defense Strategy. Projects will focus on cost-effective, mission-focused projects to design, develop, and deliver new concepts and technology prototypes aimed at supporting the Joint Force. One to three prototype efforts are anticipated in FY 2021 leveraging Joint, Service, and interagency partnerships.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Program element 0603338D8Z Defense Modernization and Prototyping is a new funding line for FY 2021. | | | |
| ***Title:*** Silent Hammer (SH)<br>***Description:*** In FY 2021, the SH Demonstration Program will transition from PE 0603699D8Z Emerging Capabilities Technology Development. SH is a multi-year, multi-agency, series of field experimentation activities. SH explores and demonstrates new EW and cyber technologies and approaches through the use of large-scale, dynamic field experiments. SH includes scripted and dynamic scenarios to experiment with the efficacy of both existing and new capabilities to engage emerging electromagnetic spectrum threats. The EW Community of Interest, Executive Committees, and warfighters are involved in the selection of follow-on experimentation topics, technology demonstrations, and scoping of these efforts to ensure their maximum relevance and value.<br>***FY 2021 Plans:***<br>Planning and preparation for SH 2 will continue through early FY 2021, with SH 2 scheduled for mid-FY 2021.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Program element 0603338D8Z Defense Modernization and Prototyping is a new funding line for FY 2021. | 0.000 | - | 4.000 |
| **Accomplishments/Planned Programs Subtotals** | 0.000 | - | 64.650 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

ECTD leverages the DoD's most efficient and effective acquisition approaches for rapid prototyping. This includes using Other Transaction Authorities, Broad Area Announcements, and new or existing contract vehicles.

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| Appropriation/Budget Activity<br>0400 / 3 | R-1 Program Element (Number/Name)<br>PE 0603338D8Z / *Defense Modernization and Prototyping* | Project (Number/Name)<br>722 / *Time Sensitive Targeting Defeat (TSTD)* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 722: *Time Sensitive Targeting Defeat (TSTD)* | - | 0.000 | 0.000 | 9.816 | - | 9.816 | 6.897 | 6.881 | 7.058 | 7.202 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

Enabling a kill chain against a near peer competitor to maintain persistence on time sensitive targets present challenges. Time Sensitive Target Defeat (TSTD) leverages the recommendations of Special Program Missile Defeat (SPMD) JUKEBOX 18 by establishing an Integrated Joint Combined Arms Demonstration Campaign to address the challenging mission and national security needs for countering time sensitive targeting. The Demonstration Campaign is a multi-year initiative to integrating a multi-domain concept to address the critical needs for countering time sensitive targets. By forging a coalition with external and allied partners (Australia, Canada, New Zealand, the United Kingdom), the Under Secretary of Defense for Research and Engineering (USD(R&E)) will execute a live demonstration of time critical targeting to improve tactics, techniques, and procedures while improving the operational planning and effectiveness of the find, fix, and kill chains of future Joint Warfighting Concepts. TSTD will establish the foundation for resolving challenges with future weapon systems and command and control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR).

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Mission Integration Support for Prototyping and Experimentation with Time Sensitive Target Defeat (TSTD) Concepts | 0.000 | - | 9.816 |
| ***Description:*** Activities focus on demonstrating new capabilities and providing integration support for prototyping, experimentation, and mission engineering projects. These activities will enable the assessment and validation of innovative sensing; command and control (C2); processing, exploitation, and dissemination (PED); and effects-based joint mission capabilities through integrated simulation and experimentation activities. TSTD's mission engineering expertise enables the evaluation of developmental concepts in realistic scenarios or exercises with warfighter input to validate the expected performance in future warfighting environments prior to transitioning the capability to the field. Ultimately, TSTD efforts allow for leave behind capabilities and accelerated low rate production decisions.<br><br>***FY 2021 Plans:***<br>Time Sensitive Target Defeat (TSTD) integrates a multi-domain TSTD initiative to decrease the kill chain execution timeline for mission enduring capability by integrating the Department's modernization prototype initiatives to enable the find, fix, and kill Joint Warfighting Concepts. TSTD will establish an Integrated Joint Combined Arms Demonstration Campaign Plan to demonstrate a live multi-domain kill chains across land, air, sea, cyberspace, and space as operationally feasible. The objectives are to acquire, demonstrate, and deliver prototype capabilities to close existing time sensitive targeting (TST) kill chains by enhancing their ability to degrade, counter, or defeat adversarial intent. To increase mission success, TSTD will increase technical rigor by imposing a Government Reference Architecture (GRA) standard to devolve technical requirements of the prototypes and identify promising solutions that will enhance the TST kill chains of the Joint Warfighting Concepts. | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603338D8Z / *Defense Modernization and Prototyping* | **Project (Number/Name)**<br>722 / *Time Sensitive Targeting Defeat (TSTD)* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| The TSTD objectives:<br>- Conduct a live time critical targeting demonstration via the Integrated Joint Combined Arms Demonstration Campaign<br>- Establish an allied partnership to enable a participation within the Demonstration Campaigns<br>- Develop and demonstrate prototyping capabilities to close existing TST kill webs<br>- Conduct sensor payload integration to increase persistence and enable long range fires<br>- Integration of new Command and Control (C2) architectures<br>- Provide an execution path to transition prototypes as a "leave-behind capability."<br>- Incorporate Rapid Integration Strategy for Experimentation/Prototypes (RISE) to integrate into the doctrine, organization, training, materiel, leadership and education, personnel, and facilities (DOTMLP-F) for transitioning or leave behind capabilities<br>- Define the pathways to incorporate cyber and electronic warfare into the multi-domain concept of TSTD<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Program element 0603338D8Z Defense Modernization and Prototyping is a new funding line for FY 2021. | | | |
| **Accomplishments/Planned Programs Subtotals** | 0.000 | - | 9.816 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

The acquisition strategy consists of developing and integrating multi-domain solution to optimize fielded weapon systems, sensors, command & control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) and effects. Provide a venue for leveraging the Integrated Joint Combined Arms Demonstration Campaign to emulate the operational environments and validate the conceptual architectures and leave behind prototype capabilities. Use mission engineering, Government Reference Architecture (GRA), and analysis to develop technical requirements, identify promising solutions, and inform future investment decisions. The acquisition strategy consists of partnering with small businesses, industry, Federally Funded Research and Development Centers and University Affiliated Research Centers. The implementation of Rapid Integration Strategy for Experimentation/Prototypes (RISE) provides an agile approach to integrating DOTMLP-F for transitioning or leave behind prototyping capabilities. Time Sensitive Target Defeat (TSTD) leverages the DoD's most efficient and effective acquisition approaches for rapid prototyping to align with the Department modernization priorities.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 3 | R-1 Program Element (Number/Name)<br>PE 0603338D8Z / *Defense Modernization and Prototyping* | Project (Number/Name)<br>723 / *Red Teaming (RT)* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 723: *Red Teaming (RT)* | - | 0.000 | 0.000 | 9.886 | - | 9.886 | 9.927 | 9.911 | 10.941 | 11.164 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

In FY 2021, the Red Teaming project code will transition from PE 0603699D8Z Emerging Capabilities Technology Development. The Red Teaming project supports assessments and demonstrations to stress and assess emerging systems with the intent of gaining or maintaining overmatch earlier in the life cycle. The project helps to assess the susceptibility and vulnerability of emerging technologies and newly developed systems, and helps identify unanticipated disruptive opportunities and technological dead ends. The project improves systems by reducing vulnerabilities and providing a holistic understanding of employment risks in operationally representative environments and against potential threats prior to full funding commitments. The Red Teaming project supports three broad types of red teaming: 1) Early stage horizon scanning and assessments of weaknesses and opportunities of pre-development technologies from an adversary perspective; 2) Targeted, low-fidelity prototypes to assess utility and inform design choices prior to funding commitments; and 3) Red teams, war games, and field experiments with maturing technology to understand how to implement new technologies and adapt to adversary responses. This effort leverages the innovative capabilities of other defense red teaming organizations within the Department, Federally Funded Research and Development Centers (FFRDCs), government laboratories, and academia. Deliverables will inform requirements, develop new concepts of operations (CONOPS), and help accelerate technology acquisition pathways for joint missions.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Red Teaming to Support DoD Modernization Priorities | 0.000 | - | 9.886 |
| ***Description:*** Red Teaming to Support DoD Modernization Priorities funds efforts to explore new joint mission capabilities in a competitive environment. Efforts include: 1.) Early investigations and red teaming to identify and understand potential vulnerabilities and opportunities from emerging and conceptual technologies. Projects will help define and anticipate impacts from new technologies, including current DoD investments and external technologies, to understand operational utility and identify threats from tangentially related sectors that can have significant negative impacts on current DoD investments. 2.) Maturation of Service and Defense Agency identified prototypes to enable red teaming, demonstrations, experiments, and CONOPS earlier in the development cycle. These prototypes increase agility and rate of innovation for emerging capabilities, while reducing cost and risk. 3.) Exploring unconventional approaches to counter current DoD and adversary technologies through red teams, war games, simulation exercises, and studies that employ government laboratory scientists; subject matter experts; and, students of science, technology, engineering, and math disciplines. Red teaming events range from distributed table-top games to simulated and live field exercises with non-traditional and operationally experienced participants. Deliverables include characterizations of future prototypes, requirement definitions, recommendations on system operational employment, potential vulnerabilities, and likely countermeasures that could be taken by the threat as well as potential counter-countermeasures to increase functionality or operational effectiveness of the system. The USD(R&E) will leverage these products to inform how technologies and integrated systems can perform in hostile environments and develop new CONOPS. | | | |
| ***FY 2021 Plans:*** | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603338D8Z / *Defense Modernization and Prototyping* | **Project (Number/Name)**<br>723 / *Red Teaming (RT)* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Investment decisions for red teaming are made during the execution year in response to Department, Combatant Command, Service, and other government organization priorities and as new threats emerge or new opportunities are presented. In FY 2021, this project anticipants funding five to ten efforts to investigate red and blue impacts of technologies associated with DoD modernization priorities. Potential projects include assessments and demonstrations of electronic warfare capabilities and weaknesses; operations with high-bandwidth over-the-horizon networked communications; emerging near-peer counters in the areas of fully networked, smart devices; quantum sensors; autonomous solutions for contested logistics; and other potential counters to future U.S. technology investments. Project selection will be guided by DoD modernization priorities, the National Defense Strategy, and priorities and gaps identified by the Department, Combatant Commands, Services, other government organizations, FFRDCs, academia, and industry as new threats emerge or new opportunities are presented.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Program element 0603338D8Z Defense Modernization and Prototyping is a new funding line for FY 2021. | | | |
| **Accomplishments/Planned Programs Subtotals** | 0.000 | - | 9.886 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603342D8Z / *Defense Innovation Unit (DIU)* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 0.000 | 0.000 | 29.398 | 26.141 | - | 26.141 | 26.849 | 27.383 | 28.056 | 28.628 | Continuing | Continuing |
| 434: *DIU* | 0.000 | 0.000 | 29.398 | 26.141 | - | 26.141 | 26.849 | 27.383 | 28.056 | 28.628 | Continuing | Continuing |

**Note**

In FY 2017, Defense Innovation Unit Experimental (DIUx) was transferred from OSD (PE 0602230D8Z) to Washington Headquarters Services (WHS) (PE 0603342D8W). In July 2018, DIUx was realigned from WHS to the Office of the Under Secretary of Defense, Research and Engineering (OUSD(R&E)). In August 2018, DIUx was re-designated the Defense Innovation Unit (DIU) to signify a permanence of the program. Effective FY 2020, DIU funding transferred from WHS PE 0603342D8W to OSD PE 0603342D8Z consistent with the realignment and establishment of USD(Research & Engineering), and disestablishment of USD(Acquisition, Technology, & Logistics). In FY 2018 and FY 2019, this program had $23.498 million and $29.198 million, respectively, in PE 0603342D8W.

The U.S. Department of Defense (DoD) relies on innovation to maintain our nation's ability to deter, and if need be, prevail in conflict. DIU increases the Department's access to leading-edge technologies and talent that reside in the commercial sector, with the ultimate goal of accelerating innovation into the hands of the warfighter. Working across the country, and in collaboration with allied international partners, DIU is developing new ways of doing business, growing our defense industrial base to include "non-traditional" companies that had previously not collaborated with the military, working with traditional vendors in novel ways to increase efficiency, and challenging innovators to share their knowledge and expertise in support of our nation's defense.

**A. Mission Description and Budget Item Justification**

Defense Innovation Unit Experimental (DIUx) was established in April 2015 and DIUx 2.0 in May 2016.

The DIU mission is to accelerate innovation in the commercially-focused technology sector to the warfighter. The 2018 National Defense Strategy asserts that we have returned to an era of inter-state strategic competition with Russia and China, heightening the sense of urgency with which the nation, and DoD in particular, must reform our acquisition policies and approach to sustaining military-technical superiority. Adversaries are challenging the U.S. across several dimensions. Most importantly, adversaries are at par or ahead of the U.S. in critical technology areas. Consistent with the FY 2020 OMB/OSTP research and development budget priorities, this new era of competition requires technological superiority to ensure ability to project power, maintain international norms and rule of law, and to serve as a credible deterrence. Notably, the critical technologies that forge military-technical superiority are increasingly dual-use and rapidly developed by the commercial sector. The DIU program will find and provide access to leading-edge technology companies on behalf of DoD organizations. Additionally, DIU will execute projects to leverage commercial sector technology analogous to military application thereby increasing dual-use technology agility for the DoD.

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603342D8Z *I Defense Innovation Unit (DIU)* |

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 0.000 | 29.398 | 29.178 | - | 29.178 |
| Current President's Budget | 0.000 | 29.398 | 26.141 | - | 26.141 |
| Total Adjustments | 0.000 | 0.000 | -3.037 | - | -3.037 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | - | - | | | |
| • Reduction for Defense Wide Review | - | - | -3.008 | - | -3.008 |
| • Other Adjustments | - | - | -0.029 | - | -0.029 |

**Change Summary Explanation**

Defense-Wide Review: The FY 2021 funding request was reduced by $3.008 million during DWR to realign funds for higher priority DoD missions.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 3 | R-1 Program Element (Number/Name)<br>PE 0603342D8Z / *Defense Innovation Unit (DIU)* | Project (Number/Name)<br>434 / *DIU* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 434: *DIU* | 0.000 | 0.000 | 29.398 | 26.141 | - | 26.141 | 26.849 | 27.383 | 28.056 | 28.628 | Continuing | Continuing |

**Note**

Defense Innovation Unit Experimental (DIUx) was established in April 2015 and DIUx 2.0 in May 2016. In FY 2017, Defense Innovation Unit Experimental (DIUx) was transferred from OSD (PE 0602230D8Z) to Washington Headquarters Services (WHS) (PE 0603342D8W). In July 2018, DIUx was realigned from WHS to the Office of the Under Secretary of Defense, Research and Engineering (OUSD(R&E)). In August 2018, DIUx was re-designated the Defense Innovation Unit (DIU) to signify a permanence of the program. Effective FY 2020, DIU funding will transfer from WHS PE 0603342D8W to OSD Program Element 0603342D8Z consistent with the realignment and establishment of USD(Research & Engineering), and disestablishment of USD(Acquisition, Technology, & Logistics).

**A. Mission Description and Budget Item Justification**

The DIU mission is to accelerate innovation to the warfighter by leveraging commercial technology innovations. The 2018 National Defense Strategy asserts that we have returned to an era of inter-state strategic competition with Russia and China, heightening the sense of urgency with which the nation, and Department of Defense (DoD) in particular, must reform our acquisition policies and approach to sustaining military-technical superiority. Adversaries are challenging the U.S. across several dimensions. Most importantly, adversaries are at par or ahead of the U.S. in critical technology areas. Consistent with the FY 2020 OMB/OSTP research and development budget priorities, this new era of competition requires technological superiority to ensure ability to project power, maintain international norms and rule of law, and to serve as a credible deterrence. Notably, the critical technologies that forge military-technical superiority are increasingly dual-use and rapidly developed by the commercial sector. The DIU program will find and provide access to leading-edge technology companies on behalf of DoD organizations. Additionally, DIU will execute projects to leverage commercial sector technology analogous to military application thereby increasing dual-use technology agility for the DoD.

The U.S. DoD relies on innovation to maintain our nation's ability to deter, and if need be, prevail in conflict. The DIU increases the Department's access to leading-edge technologies and talent that reside in the commercial sector, with the ultimate goal of accelerating innovation into the hands of the warfighter. Working across the country, and in collaboration with allied international partners, DIU is developing new ways of doing business, growing our defense industrial base to include "non-traditional" companies that had previously not collaborated with the military, working with traditional vendors in novel ways to increase efficiency, and challenging innovators to share their knowledge and expertise in support of our nation's defense.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Defense Innovation Unit - Experimental (DIU) | 0.000 | 29.398 | 26.141 |
| ***Description:*** The U.S. DoD relies on innovation to maintain our nation's ability to deter, and if need be, prevail in conflict. With outposts in Mountain View, California, Cambridge, Massachusetts, Washington, D.C., and Austin, Texas, DIU serves as a bridge between those in the U.S. Military executing our nation's highest priority problems with companies developing cutting technology for the commercial sector. DIU continuously experiments on methods to identify, contract, prototype, and transition | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603342D8Z / *Defense Innovation Unit (DIU)* | **Project (Number/Name)**<br>434 / *DIU* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| novel technology with commercial entities that would not otherwise do work with the DoD. The end goal is to accelerate the adoption of cutting-edge technology and grow the defense industry base for the warfighter.<br><br>***FY 2020 Plans:***<br>DIU continues its mission to identify and deliver cutting-edge commercial innovation to the Joint Force. DIU is rapidly prototyping and deploying innovative commercial technologies to fill critical capability gaps identified by DoD customers in the Services, Defense Agencies, and Combatant Commands. DIU works to solve challenges and issues for the Department in areas such as Artificial Intelligence and Machine Learning, Autonomy, Human Systems, Information Technology, and Space. In FY 2020, DIU will add two new technology focus areas of Power and Energy, and Advanced Materials to develop and deliver technologies within the fields of Tactical Power, Operational Power, Directed Energy, and Hypersonics. DIU has plans to expand it's presence in Austin, TX to optimize outreach with innovative commercial sources and enhance collaboration with the newly established Army Futures Command.<br><br>***FY 2021 Plans:***<br>DIU will continue its mission to identify and deliver cutting-edge commercial innovation to the Joint Force. DIU is rapidly prototyping and deploying innovative commercial technologies to fill critical capability gaps identified by DoD customers in the Services, Defense Agencies, and Combatant Commands. DIU works to solve challenges and issues for the Department in areas such as Artificial Intelligence and Machine Learning, Autonomy, Human Systems, Information Technology, and Space.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>DWR: The FY 2021 decrease of $3.008 million will result in a re-balance of investments across the technology focus areas of Artificial Intelligence and Machine Learning, Autonomy, Human Systems, Information Technology, Space, Advanced Technology Material and Manufacturing, and Power and Energy. | | | |
| **Accomplishments/Planned Programs Subtotals** | 0.000 | 29.398 | 26.141 |

**C. Other Program Funding Summary ($ in Millions)**

| Line Item | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|
| • PE 0901583D8Z: *O&M* | 11.384 | 17.358 | 17.705 | - | 17.705 | 18.059 | 18.420 | 18.789 | 19.165 | Continuing | Continuing |
| • PE 0603342D8W: *DIUx* | 29.198 | 0.000 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | - | Continuing | Continuing |

**Remarks**

DIU O&M mission support funding; prior year RDT&E funds were in PE 0603342D8W.

**D. Acquisition Strategy**

N/A

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603375D8Z / *Technology Innovation* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 84.720 | 25.856 | 30.000 | 27.709 | - | 27.709 | 25.735 | 34.088 | 41.295 | 42.528 | Continuing | Continuing |
| 375: *Technology Innovation* | 84.720 | 25.856 | 30.000 | 27.709 | - | 27.709 | 25.735 | 34.088 | 41.295 | 42.528 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

The Department of Defense (DoD) has a long history of technological breakthroughs and innovations originating from within the Department. In order to sustain technological superiority, the Department must take advantage of the rapid evolution of emerging technologies that will be a source of battlefield advantage, when integrated with military systems and novel concepts of operation.

Leveraging innovative technologies from both defense and commercial sources, to include non-traditional sources such as startup companies, has the potential to rapidly address warfighter problem sets in areas where commercial innovation outstrips government investment in the same technology areas. This funding will be used to mature and demonstrate emerging technologies, such as the Department's Modernization Technology Areas, that contribute to the broader joint mission needs.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 33.068 | 60.000 | 68.000 | - | 68.000 |
| Current President's Budget | 25.856 | 30.000 | 27.709 | - | 27.709 |
| Total Adjustments | -7.212 | -30.000 | -40.291 | - | -40.291 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | -30.000 | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | -6.000 | - | | | |
| • SBIR/STTR Transfer | -1.207 | - | | | |
| • Internal Realignment | - | - | -14.705 | - | -14.705 |
| • Reduction for Defense Wide Review | - | - | -24.982 | - | -24.982 |
| • Economic Assumption | - | - | -0.049 | - | -0.049 |
| • Other Adjustments | -0.005 | - | -0.555 | - | -0.555 |

**Change Summary Explanation**

In FY 2020, there is a congressional reduction of -$30.000 million due to insufficient justification.

In FY 2021, internal realignment based on previous Congressional reductions.

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603375D8Z / *Technology Innovation* |

Defense-Wide Review: The FY 2021 funding request was reduced by $24.982 million during DWR to realign funds for higher priority DoD missions.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 3 | R-1 Program Element (Number/Name)<br>PE 0603375D8Z / *Technology Innovation* | Project (Number/Name)<br>375 / *Technology Innovation* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 375: *Technology Innovation* | 84.720 | 25.856 | 30.000 | 27.709 | - | 27.709 | 25.735 | 34.088 | 41.295 | 42.528 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

This program focuses on rapid innovation and demonstration with emerging technology to address priority warfighter problem sets and National Defense Strategy technology focus areas. By leveraging Service activities and establishing partnerships with other government agencies (OGAs) such as the Intelligence Community (IC) and the Department of Homeland Security, a wide variety of emerging military and commercial technologies are rapidly assessed for applicability to the National Defense Strategy technology focus areas and a broad spectrum of priority DoD problem sets. Enabling the warfighter to execute short duration pilots with these emerging technologies provides a cost effective way to leverage commercial investment for DoD purposes, sharing costs with OGA partners, informing warfighter requirements for follow-on acquisition through traditional DoD channels, and allowing other DoD R&D organizations to focus their resources on both the integration of commercial technologies showing promise in these warfighter pilots as well as on traditional R&D in technologies not well served by commercial start-up companies.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Technology Innovation | 25.856 | 30.000 | 27.709 |
| ***Description:*** The Program focuses rapid innovation and demonstration in emerging defense and commercial technology areas to address the National Defense Strategy technology focus areas and priority warfighter problem sets. FY2019 examples include funding of promising commercial advanced technology demonstration projects in the areas of biotechnology, quantum science, fully networked command, control, and communications, and space. | | | |
| ***FY 2020 Plans:***<br>Apply rapid innovation and demonstration by leveraging innovative technologies from both defense and commercial sources to address the National Defense Strategy technology focus areas, in alignment with the DoD technology modernization roadmaps. | | | |
| ***FY 2021 Plans:***<br>Further expand support across all National Defense Strategy technology focus in alignment with the DoD technology modernization roadmaps. Establish Service partners to facilitate transition of successful work program pilots into enterprise solutions for the warfighter, to include the following Biotechnology and Quantum efforts:<br>(1) Advance emerging biotechnologies; and<br>(2) Transition path for DARPA's atomic clock with enhanced stability to reach technology readiness level (TRL) 7 by FY 2025 and commercial availability by FY 2027. | | | |
| ***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Due to Congressional reductions, the focus for this program has changed in order to align with DoD high priority efforts. | | | |
| **Accomplishments/Planned Programs Subtotals** | 25.856 | 30.000 | 27.709 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603375D8Z / *Technology Innovation* | **Project (Number/Name)**<br>375 / *Technology Innovation* |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

N/A

**D. Acquisition Strategy**

N/A

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603527D8Z / *Retract Larch* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 484.242 | 161.453 | 159.688 | 130.283 | - | 130.283 | 139.226 | 140.431 | 144.242 | 147.538 | Continuing | Continuing |
| 527: *Retract Larch* | 484.242 | 161.453 | 159.688 | 130.283 | - | 130.283 | 139.226 | 140.431 | 144.242 | 147.538 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

This program is reported in accordance with Title 10, United States Code, Section 119(a)(1) in the Special Access Program Annual Report to Congress. For further information, please contact the Principal Deputy, Director of Defense for Research and Technology, in the Office of the Under Secretary of Defense for Research and Engineering.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 160.762 | 159.688 | 162.759 | - | 162.759 |
| Current President's Budget | 161.453 | 159.688 | 130.283 | - | 130.283 |
| Total Adjustments | 0.691 | 0.000 | -32.476 | - | -32.476 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | 6.000 | - | | | |
| • SBIR/STTR Transfer | -5.281 | - | | | |
| • Other Adjustments | -0.028 | - | -7.811 | - | -7.811 |
| • Economic Assumption | - | - | -0.207 | - | -0.207 |
| • Re-alignment from PE 0604942D8Z | - | - | 12.280 | - | 12.280 |
| • Reduction for Defense Wide Review | - | - | -36.738 | - | -36.738 |

**Change Summary Explanation**

The Other Adjustments of $7.811 for FY 2021 reflects a realignment of funds to address other OUSD(R&E) priorities for the modernization priority areas.

The FY 2021 $12.280 million increase is the result of a functional transfer from the Special Access Program from OUSD(A&S) PE 0604942D8Z/P805 to OUSD(R&E) 0603527D8Z/P527.

Defense-Wide Review: The FY 2021 funding request was reduced by $36.738 million during DWR to realign funds for higher priority DoD missions.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 3 | R-1 Program Element (Number/Name)<br>PE 0603527D8Z / *Retract Larch* | Project (Number/Name)<br>527 / *Retract Larch* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 527: *Retract Larch* | 484.242 | 161.453 | 159.688 | 130.283 | - | 130.283 | 139.226 | 140.431 | 144.242 | 147.538 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

This program is reported in accordance with Title 10, United States Code, Section 119(a)(1) in the Special Access Program Annual Report to Congress. For further information, please contact the Director, Resource Management in the Office of the Under Secretary of Defense for Research and Engineering

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Retarct Larch | 161.453 | 159.688 | 130.283 |
| ***Description:*** Information is classified.<br><br>***FY 2020 Plans:***<br>Information is classified.<br><br>***FY 2021 Plans:***<br>Information is classified.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funds were adjusted internally for priority DoD missions and includes a realignment of funds from Program Element 0604942D8Z/ P805. | | | |
| **Accomplishments/Planned Programs Subtotals** | 161.453 | 159.688 | 130.283 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603618D8Z / *Joint Electronic Advanced Technology* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 14.020 | 12.680 | 12.063 | 15.164 | - | 15.164 | 15.425 | 15.642 | 15.966 | 16.230 | Continuing | Continuing |
| 619: *EW and Non-Kinetic Effects Experimentation and Oversight* | 11.770 | 11.999 | 0.000 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| 245: *EW Enterprise Exploration and Innovation* | 2.250 | 0.681 | 12.063 | 15.164 | - | 15.164 | 15.425 | 15.642 | 15.966 | 16.230 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

The electromagnetic spectrum (EMS) environment (EME) is the largest and most complex warfighting environment because it is universally pervasive, largely unseen and can only be perceived through the use of advanced electronics technologies. Understanding and managing EME warfighting challenges is essential to all military operations because it is through the use of EMS technologies that we perceive operational realities – the state and disposition of all military and nonmilitary groups/ forces − and coordinate all actions of our military forces.

Historically, the United States has had technological advantages in EME warfighting technologies (i.e., sensors, communications and countermeasures), however, this is no longer the case in many technology areas due to the broad proliferation of advanced technologies, the rapid commercialization of advanced electronic systems and components and the concurrent rise of cyber-related technologies. Leveraging these advanced technologies, adversaries are developing and fielding competing and asymmetric capabilities to offset past U.S. advantages. Their efforts are making U.S. operations in the EMS and cyberspace significantly more difficult, and they are doing these things at accelerating rates. Their developments include new generations of challenging threats ranging from small unmanned air systems and easily transportable Man-Portable Air Defense Systems (MANPADS) to dedicated military systems incorporating the most advanced sensing, communication and electronic warfare (EW) technologies such as integrated air defense systems and increasingly capable cruise and ballistic missiles.

The accelerating rate at which new EMS and cyber threats are appearing demands much faster responses than traditional Department of Defense (DoD) research, development and acquisition (RD&A) processes can provide. Concurrently, the effective operational lifetime of many advanced technology solutions is decreasing due to the accelerating pace of technological innovation. For these reasons, we must begin developing technological solutions much quicker and at much lower costs.

The Joint Electronic Advanced Technology (JEAT) Program was established to address these challenges through efforts designed to substantially accelerate the development and transition of innovative technology solutions to EMS warfighting challenges. To do this, the JEAT program rapidly identifies, explores, develops, matures and demonstrates technologies and approaches that fall outside the Services' purviews. By using both off-the-shelf and new military and commercial technologies in innovative ways, JEAT's approach has enabled needed capabilities to be delivered to the warfighter much sooner than possible by traditional DoD approaches and have also resulted in substantial savings for the Department in both research and development (R&D) and in Programs of Record.

Beginning in FY 2020, all JEAT work has been moved into Project 245, EW Enterprise Exploration and Innovation. Project 619, EW and Non-Kinetic Effects Experimentation and Oversight, was terminated and the efforts previously conducted within in Project 619 were moved into Project 245.

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603618D8Z *I Joint Electronic Advanced Technology* |

PROJECT 619, EW AND NON-KINETIC EFFECTS EXPERIMENTATION AND OVERSIGHT

Project 619 previously included three efforts: Experimentation/Demonstration, Advanced Technology Development/Verification and EW Enterprise Collaboration and Planning. All Project 619 efforts were moved into Project 245 in FY 2020.

PROJECT 245, EW ENTERPRISE EXPLORATION AND INNOVATION (EW E&I)

EW E&I identifies, explores, develops and rapidly matures and demonstrates EMS and hybrid electronic warfare (EW)-Cyber warfighting technology solutions at rates that are significantly faster than traditional Department developmental efforts and at much lower costs. To do this, a thorough understanding of all the EMS and EW-Cyber challenges confronting warfighters and technology developers is foundational. Knowledge of all of the efforts to mitigate these challenges is also essential. Utilizing this knowledge, innovative potential technology solutions that fall outside the Services' purviews are identified and developed in state-of-the-art laboratory environments. Promising potential solutions are then validated by fully exploring them side-by-side with existing capabilities and other potential technology solutions in real-world experimentation environments under real-world conditions. To provide the greatest possible insights, these experimentation environments are designed so that they are operationally realistic − utilizing the most realistic threats available − and environmentally realistic – utilizing near-real-world EMS environments. The knowledge gained through EW E&I efforts accelerates the transition of capabilities to the warfighter and informs senior leaders so they can more effectively oversee and direct all Department EW and EW-Cyber developmental efforts.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 12.889 | 12.063 | 12.280 | - | 12.280 |
| Current President's Budget | 12.680 | 12.063 | 15.164 | - | 15.164 |
| Total Adjustments | -0.209 | 0.000 | 2.884 | - | 2.884 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | -0.207 | - | | | |
| • Re-alignment of funds for EMS | 0.000 | - | 2.899 | - | 2.899 |
| • Economic Adjustment | - | - | -0.015 | - | -0.015 |
| • Other Adjustment | -0.002 | - | - | - | - |

**Change Summary Explanation**

Re-alignment of funds from 0604055D8Z to accelerate work on invisible Electronic Manufacturing Services (EMS) and cyber environment; next generation fully adaptive radar.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 3 | R-1 Program Element (Number/Name)<br>PE 0603618D8Z / *Joint Electronic Advanced Technology* | Project (Number/Name)<br>619 / *EW and Non-Kinetic Effects Experimentation and Oversight* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 619: *EW and Non-Kinetic Effects Experimentation and Oversight* | 11.770 | 11.999 | 0.000 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

Project 619, EW and Non-Kinetic Effects Experimentation and Oversight explored and assessed innovative technologies and approaches to rapidly mitigate advanced threats and demonstrate new overmatch technologies. The three efforts previously conducted within Project 619, Experimentation/Demonstration, Advanced Technology Development/Verification and EW Enterprise Collaboration and Planning were moved into Project 245 in FY 2020.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Experimentation/Demonstration (Expt/Demo)<br>***Description:*** Leveraging JEAT's history of conducting highly successful experimentation venues, SILENT HAMMER (SH), our new multi-year, multi-agency, series of field experimentation venues, will explore, assess, mature, and accelerate technologies and approaches for multi-platform, multi-aperture, multi-domain (M3) passive/active sensing in complex and congested EMS environments. As with earlier Project 619 experimentation venues, SH and subsequent venues will be scoped to address the most pressing EMS threats and issues. The EW and Cyber Communities of Interest and Executive Committees and warfighters are involved in the selection of follow-on venue topics and scoping of these efforts to ensure their maximum relevance and value. | 6.172 | - | - |
| ***Title:*** Advanced Technology Development/Verification (ATD/V)<br>***Description:*** ATD/V research efforts mature and assess emerging technologies to address compelling EW and converged EW-Cyber warfighting needs. They focus on identifying and integrating advanced technologies to synergistically create effects that are far greater than the sum of the constituent systems and identifying nearer term, lower cost, and more effective solutions. Many of these efforts utilize JEAT's DEED Laboratory, which integrates promising technologies into unmanned aerial vehicles for further exploration and assessment in venues like SILENT HAMMER. | 1.714 | - | - |
| ***Title:*** EW Enterprise Collaboration and Planning (EW C&P)<br>***Description:*** Coordinates, oversees, and manages all EMS warfare-related R&D activities within OUSD(R&E). Maintains cognizance of all EW capabilities and capability development efforts worldwide; oversees all EW-related R&D activities across DoD; explores new and innovative EMS technologies and approaches; coordinates Departmental EW-related R&D, protocols, and policy; analyzes requisite development and operational interfaces across DoD and with international partners; and reports relevant information to senior leaders and across the Department, as well as to Congress and other external groups. | 4.113 | - | - |
| **Accomplishments/Planned Programs Subtotals** | 11.999 | - | - |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603618D8Z / *Joint Electronic Advanced Technology* | **Project (Number/Name)**<br>619 / *EW and Non-Kinetic Effects Experimentation and Oversight* |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | | | | | | | | | Date: February 2020 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 3 | | | | | R-1 Program Element (Number/Name)<br>PE 0603618D8Z / *Joint Electronic Advanced Technology* | | | | Project (Number/Name)<br>245 / *EW Enterprise Exploration and Innovation* | | | |
| **COST ($ in Millions)** | **Prior Years** | **FY 2019** | **FY 2020** | **FY 2021 Base** | **FY 2021 OCO** | **FY 2021 Total** | **FY 2022** | **FY 2023** | **FY 2024** | **FY 2025** | **Cost To Complete** | **Total Cost** |
| 245: *EW Enterprise Exploration and Innovation* | 2.250 | 0.681 | 12.063 | 15.164 | - | 15.164 | 15.425 | 15.642 | 15.966 | 16.230 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

Project 245, EW Enterprise Exploration and Innovation (EW E&I), identifies, explores, develops and rapidly matures and demonstrates EMS and hybrid electronic warfare (EW)-Cyber warfighting technology solutions at rates that are significantly faster than traditional Department developmental efforts and at much lower costs. Maintaining awareness of all EW and EW-Cyber research and development (R&D) efforts globally enables the selection of internal JEAT development efforts and provides analyses and insights for senior decision-makers to ensure effective direction of all Department EW and EW-Cyber technology programs and processes. Internal JEAT developmental efforts investigate and mature technologies and approaches to counter advanced EMS threats in innovative ways and enable the development of compelling new warfighting technologies. JEAT's large-scale open-air, dynamic field experimentation venues explore and validate promising potential technology solutions side-by-side with existing and other developmental technologies to provide the greatest possible insights to senior leaders directing the Department's EW and EW-Cyber capabilities development efforts. Current and future experimentation venues will be selected, designed and directed within EW E&I but funding for the execution of them will be provided by Program Element 0603699D8Z, Emerging Capabilities Technology Development.

Understanding. EW E&I "understanding" efforts maintain awareness of all EW and EW-Cyber R&D efforts globally. In addition to guiding internal JEAT development efforts, they also provide analyses and technology deep dives to give key insights to senior decision-makers so they can effectively direct all Department EW and EW-Cyber technology development programs and processes.

Identifying and Developing Innovative Solutions. These efforts investigate and mature technologies and approaches to counter advanced EMS threats in innovative ways and develop new overmatch technologies. They develop, mature and demonstrate new EW and EW-Cyber technologies in state-of-the-art laboratory environments and include, e.g., the development and validation of new EW countermeasures and nonkinetic battle management technologies to vastly simplify operational planning and decision-making for EMS operations.

Exploring Potential Solutions. The JEAT Program developed and continues to pioneer the use of large-scale open-air, dynamic field experimentation venues as powerful tools for technology discovery and maturation. These overwhelmingly successful venues firmly established this type of experimentation as an invaluable tool for both technology acceleration and cost savings. Current and future experimentation venues will be selected, designed and directed within this effort but funding for the execution of them will be provided by Program Element 0603699D8Z, Emerging Capabilities Technology Development.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** EW Enterprise Exploration and Innovation | 0.681 | 12.063 | 15.164 |
| ***Description:*** EW E&I efforts identify, explore, mature and assess emerging technologies to address compelling EW and converged EW-Cyber warfighting needs. EW E&I involves three classes of efforts. | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603618D8Z / *Joint Electronic Advanced Technology* | **Project (Number/Name)**<br>245 / *EW Enterprise Exploration and Innovation* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Understanding. To maintain awareness of the global state of EW and EW-Cyber technology development, this effort coordinates and oversees all EMS warfare-related R&D activities within the Department and manages R&D activities within OUSD(R&E). Work within this effort includes:<br>• Maintaining cognizance of all EW capabilities and capability development efforts worldwide.<br>• Overseeing all EW and EW-Cyber related R&D activities across DoD.<br>• Exploring new and innovative EMS technologies and approaches and advocating their development and adoption.<br>• Coordinating Department EW and EW-Cyber-related R&D, protocols, and policy efforts.<br>• Analyzing requisite development and operational interfaces across DoD and with international partners.<br>• Reporting relevant information to senior leaders, across the Department and to Congress and other external groups.<br>• Providing recommendations for development and acquisition programs that address EW- and EW-Cyber-related threats impacting sensors, seekers, communications, platform survivability, countermeasures, and EMS battle management.<br>• Providing technical and analytic support to the Office of the Under Secretary of Defense for Acquisition and Sustainment (OUSD(A&S)) on Programs of Record, Joint Urgent Operational Needs and efforts involving technology maturity and availability, critical program information standards, foreign disclosure, and technical signals requirements.<br>• Conducting deep dives and analyses of technological opportunities and advanced threats to support Departmental EW and EW-Cyber R&D efforts.<br><br>Identifying and Developing Innovative Solutions. Efforts include:<br>• Identifying, developing and integrating advanced technologies to synergistically create EW and EW-Cyber effects that are far greater than the sum of the constituent systems.<br>• Identifying and developing nearer term, lower cost, and more effective EW and EW-Cyber technology solutions.<br>• Conducting R&D within JEAT's Distributed Electronic Effects Delivery (DEED) Laboratory.<br>• Developing and validating prototypes of promising technology solutions within JEAT's DEED Laboratory.<br>• Integrating prototypes into unmanned vehicles for further exploration and assessment in experimentation venues.<br>• Conducting collaborative R&D efforts with the Services, Combatant Commands and the Intelligence Community (IC) to explore, integrate and demonstrate enhanced real-time EMS/Cyberspace situational awareness and battle management technologies within the Digital Attack Surface Execution Environment (DASEE) effort. DASEE leverages state-of-the-art computational and perception technologies including artificial intelligence, machine learning, big data, graph analytics, advanced heuristics and cognition/visualization also provide predictive analytics and course of action development.<br><br>Exploring Potential Solutions. The JEAT team is DoD's acknowledged expert in designing and conducting large-scale open air field experimentation venues. JEAT's experimentation venues are selected and scoped to explore technology solutions to some of the most difficult operational challenges facing U.S. warfighters. JEAT's experimentation venues are designed to | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603618D8Z / *Joint Electronic Advanced Technology* | **Project (Number/Name)**<br>245 / *EW Enterprise Exploration and Innovation* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| simultaneously examine numerous developmental and existing technologies side-by-side under the same conditions and they utilize realistic threats and real-world EMS environments to provide the greatest insights to operators, developers and decision-makers. Leveraging JEAT's history of conducting highly successful experimentation venues, SILENT HAMMER (SH) is our current multi-year, multi-agency series of field experimentation venues and the first SH venue, SH 1, was conducted in late FY 2019. Beginning in FY 2020, funding to conduct JEAT's experimentation venues will be provided by PE 0603699D8Z, Emerging Capabilities Technology Development.<br>• Exploring, maturing and assessing technologies and approaches for multi-platform, multi-aperture, multi-domain (M3) engagement of passive/active sensing architectures in very complex and highly congested EMS environments.<br>• Selecting, scoping, designing and conducting subsequent experimentation venues. As with earlier JEAT experimentation venues, warfighters and the EW and Cyber Communities of Interest and Executive Committees are involved in this process to ensure their maximum relevance and value to both warfighters and technology developers. | | | |
| ***FY 2020 Plans:***<br>Understanding.<br>• Support Service, Joint and international EW and EW-Cyber management and direction efforts including the EW Executive Committee and the EMS Operations Cross-Functional Team.<br>• Lead OUSD(R&E) oversight of EW and EW-Cyber development and oversight activities to include the SECDEF-chartered EW Executive Committee.<br>• Identify and oversee JEAT technology development and experimentation initiatives.<br>• Provide detailed analyses of U.S. EW vulnerabilities and recommendations for addressing them.<br>• Identify potential EW and EW-Cyber overmatch opportunities.<br>• Provide EW technical support to the Intelligence Community (IC) to enable the IC to better address critical intelligence gaps related to foreign EW and EW-Cyber capabilities and technology development efforts.<br>• Identify new EW and EW-Cyber opportunities, such as asymmetric targeting technologies, countermeasures to passive sensor threats and ways to better leverage national technical means to support the development of new EW and EW-Cyber capabilities.<br>• Lead efforts to identify subsequent JEAT experimentation venues.<br><br>Identifying and Developing Innovative Solutions.<br>• Continue exploring multi-platform/multi-aperture EW and EW-Cyber technologies.<br>• Continue developing a new EMS technology, the Next Generation Fully Adaptive Radar (NG-FAR).<br>• Continue exploring additional classified EW and EW-Cyber technologies.<br>• Develop, demonstrate and assess new EW and EW-Cyber technologies in the DEED Laboratory.<br>• Develop and assess EW and EW-Cyber technologies prototypes within the DEED Laboratory. | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603618D8Z / *Joint Electronic Advanced Technology* | **Project (Number/Name)**<br>245 / *EW Enterprise Exploration and Innovation* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| • Integrate promising prototypes onto unmanned air systems so they can be assessed in field experimentation venues such as SILENT HAMMER (see below).<br>• Continue developing, assessing and validating DASEE. Key FY 2020 DASEE efforts include conducting critical technology readiness demonstrations in operational contexts to enable subsequent demonstrations with operational users and analysts.<br><br>Exploring Potential Solutions.<br>• Design and plan SH 2 after SH 1 assessment is completed.<br>***FY 2021 Plans:***<br>Understanding.<br>• Continue all FY 2020 EW and EW-Cyber coordination, oversight and management efforts.<br><br>Identifying and Developing Innovative Solutions.<br>• Continue maturing, demonstrating and assessing EW and EW-Cyber technologies in the laboratory to include multi-platform/ multi-aperture approaches.<br>• Continue development of the Next Generation Fully Adaptive Radar (NG-FAR).<br>• Continue developing viable technology products into prototypes and integrate these prototypes into unmanned systems for demonstration and assessment in experimentation venues such as SILENT HAMMER.<br>• Continue DASEE development efforts focusing on more advanced and realistic capability demonstrations to enable earlier transition to operational users.<br><br>Exploring Potential Solutions.<br>• Continue planning for SH 2. SH 2 will tentatively be conducted in mid-FY 2021.<br>• Scope, design and begin planning for SH 3 after assessment of SH 2 is completed.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The FY 2021 increase includes a re-alignment of funds from PE 0604055D8Z, Operational Energy Capability Improvement, to accelerate work on a new EMS technology, the Next Generation Fully Adaptive Radar (NG-FAR). | | | |
| **Accomplishments/Planned Programs Subtotals** | 0.681 | 12.063 | 15.164 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603618D8Z / *Joint Electronic Advanced Technology* | **Project (Number/Name)**<br>245 / *EW Enterprise Exploration and Innovation* |

**D. Acquisition Strategy**

N/A

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603648D8Z / *Joint Capability Technology Demonstration (JCTD)* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 962.234 | 102.494 | 89.859 | 85.452 | - | 85.452 | 89.929 | 94.685 | 101.397 | 106.832 | Continuing | Continuing |
| 648: *Joint Capability Technology Demonstration (JCTD)* | 962.234 | 102.494 | 89.859 | 85.452 | - | 85.452 | 89.929 | 94.685 | 101.397 | 106.832 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

In alignment with the National Defense Strategy (NDS) and the Department of Defense (DoD) modernization priorities, the Joint Capability Technology Demonstration (JCTD) program conducts prototype demonstrations and experiments to address Combatant Commands' (CCMDs), and Joint Service urgent and emergent warfighting needs. The program delivers developmental and operational prototypes, generally within two to four years, culminating in a sponsored military utility assessment (MUA), thus enabling scale-up of science and technology from the laboratories into defense acquisition programs. The key tenets of the JCTD program are to fulfill national objectives to build a more lethal force, strengthen alliances, and enable the DoD to achieve greater performance and affordability. Following the Undersecretary of Defense, Research and Engineering (USD(R&E))'s Modernization Priority guidance, mission focused areas were co-developed with the Joint Staff to address the Chairman's gap assessment which include, but are not limited to: time-sensitive targeting (TST), advanced electronic warfare (AEW), integrated fires (IF), and fully networked command, control and communications (FNC3).

The JCTD program achieves its objectives by engaging the CCMDs, the Joint Services, interagency, international, and non-governmental partners to expand the DoD's access to prototyping and innovation. JCTDs serve as a vehicle primarily for CCMDs to address the Joint force's strategic priority mission areas that present significant risk and suffer from inadequate investment. JCTDs often address technology needs that fall into the seams between the urgent/emergent needs of CCMDs and Title-10 functions of the Military Services. Subsequently, JCTD investments are further informed by the CCMDs' integrated priority list, the capability gaps assessed through the Joint Staff, and the Military Services' science and technology roadmaps to achieve warfighter dominance. As U.S. and partner nations are increasingly orienting toward peer competition in contested environments across multiple, inter-dependent domains, and where feasible through CCMD’s sponsorship, the JCTD program looks to deliver leap-ahead operational capability in reduced time with the coordination of allied research and development (R&D) funding, technology, and industry participation. The value proposition is to affordably operationalize technologies more quickly, that enable Joint/Combined forces to access novel/leap-ahead capabilities.

JCTD outcomes are designed to accelerate technology transition by evaluating and demonstrating prototyped technologies in operationally relevant environments. Based on the results of the MUA performed under the cognizance of a CCMD sponsor, the products of a JCTD are "left behind" for additional assessment or operational use, transitioned to a program of record (PoR), or returned to the technical baseline inventory for further development. The JCTD program uses MUAs to further inform acquisition pathways to field initial capabilities faster, or prompt major acquisition program decisions prior to milestone A or B approvals. Therefore, the JCTD program serves as a technology catalyst and transition-bridge between the USD(R&E) and the Undersecretary of Defense, Acquisition and Sustainment (USD(A&S)) offices.

In FY 2019, the JCTD program successfully completed four MUAs and transitioned ten JCTD prototypes. Nine JCTDs transitioned all or select components to new or existing PoRs, and one operational prototype was directly fielded and is being sustained by non-JCTD funds in operational theaters. Since the JCTD Program was reframed in 2006, it has executed 116 prototyping projects. The historical transition rate for the JCTD program is 84 percent, including: 63 prototypes (54 percent) transitioning to a PoR; 29 prototypes (26 percent) providing "leave-behind" assets for operational fielding; and five (5) prototypes (4 percent) placed on the General

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603648D8Z *I Joint Capability Technology Demonstration (JCTD)* |

Services Administration schedule. The remaining 19 prototypes (16 percent) were returned to the technical base for further development or were terminated. Overall, the JCTD program has directly supported multiple key operations by rapidly accelerating the fielding of game changing technologies and capabilities into the hands of the Joint Warfighter.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 105.808 | 107.359 | 109.925 | - | 109.925 |
| Current President's Budget | 102.494 | 89.859 | 85.452 | - | 85.452 |
| Total Adjustments | -3.314 | -17.500 | -24.473 | - | -24.473 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | -17.500 | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | -0.400 | - | | | |
| • SBIR/STTR Transfer | -2.896 | - | | | |
| • Other Adjustments and DOD Priorities | -0.018 | - | -4.398 | - | -4.398 |
| • Economic Assumption | - | - | -0.107 | - | -0.107 |
| • Reductions From Defense Wide Review | 0.000 | 0.000 | -19.968 | - | -19.968 |

**Change Summary Explanation**

The FY 2020 Congressional reduction of $17.500 million was directed for program growth.

Defense-Wide Review: The FY 2021 funding request was reduced by $19.968 million during DWR to realign funds for higher priority DoD missions.

FY 2021 also included a $0.107 million reduction for Economic Assumptions and a $4.398 million reduction for other DOD priorities.

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| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 648: *Joint Capability Technology Demonstration (JCTD)* | 962.234 | 102.494 | 89.859 | 85.452 | - | 85.452 | 89.929 | 94.685 | 101.397 | 106.832 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

JCTD project selection is driven by the ability to accelerate transition of new prototyped capabilities to the Joint Warfighter that have strong CCMD and Joint Staff interest; cost share commitments from the Military Services and Defense Agencies; advanced technical readiness; and a well-defined and affordable transition path for long-term sustainment. JCTD mission focused areas were co-developed with the Joint Staff to address the Chairman's gap assessment which include, but are not limited to: time-sensitive targeting (TST), advanced electronic warfare (AEW), integrated fires (IF), and fully networked command, control and communications (FNC3). The final objective for the JCTD program is to maintain the United States' technological superiority across the range of military operations while reducing the cost of operations, facilitating joint interoperability, and allowing for the rapid insertion of new capabilities.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Port Improvement via Exigent Repair (PIER) | 1.120 | - | - |
| ***Description:*** Previously funded JCTD. PIER supports the National Defense Strategy's focus on logistics modernization and the need for resilient and agile logistics. PIER will deliver a dynamic, agile, cost effective (non-military construction) expeditionary engineering solution to rapidly repair damaged or degraded ports to a minimum level of serviceability after an attack or natural disaster. Agility is achieved through a smaller footprint, commercial off-the-shelf components, and quick reaction of theater-based repair assets (e.g., pre-packaged, pre-positioned). In FY 2019, PIER conducted an operational demonstration on the Pier Over-Decking Structure (PODS) and a final comprehensive military utility assessment of technologies in cooperation with U.S. Transportation Command (USTRANSCOM), U.S. Navy, and U.S. Army. Components transitioned to USTRANSCOM, U.S. Navy, and U.S. Army. JCTD completed in FY 2019. | | | |
| ***Title:*** Brilliant Effects Employment Shadow (BEES) | 4.880 | - | - |
| ***Description:*** Previously funded JCTD. BEES directly supports the Secretary of Defense's priority for increased lethality. BEES will demonstrate targeting using cooperative, multi-modal intelligence surveillance and reconnaissance (ISR) and electronic warfare (EW) sensors on autonomous, unmanned aerial systems (UAS). BEES will demonstrate autonomous behaviors to synchronize multiple ISR and EW platforms that responsively update manned strike/command and control platforms. In FY 2019, BEES conducted technical and operational demonstrations of autonomous EW and ISR behaviors as part of an integrated mission package. Service funded operational and military utility assessments will conclude in FY 2020 at which time the BEES capability will transition to a Service program of record using partner funding. | | | |
| ***Title:*** Predictive Human Intelligence (HUMINT) Crisis Model (PICK'EM) | 3.867 | - | - |

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| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Description:*** Previously funded JCTD. PICK'EM addressed capability needs identified in the U.S. Special Operations Command (USSOCOM) and U.S. Africa Command (USAFRICOM) integrated priority lists. PICK'EM leveraged machine learning and cognitive computing to provide USSOCOM, USAFRICOM, and the Defense Intelligence Agency (DIA) the capability to forecast crisis events, provide courses of action, and identify operational candidates to carry out missions in support of joint warfighters. In FY 2019, PICK'EM validated its prototype using live scenarios, conducted operational demonstrations, and military utility assessment conducted by an independent assessor. PICK'EM transitioned to the DIA, USSOCOM, and USAFRICOM and completed in FY 2019. | | | |
| ***Title:*** Pseudolite Synthetic Aperture Radar (PSAR)<br>***Description:*** PSAR supports the National Defense Strategy's focus on command, control, communications, computers, intelligence, surveillance and reconnaissance (C4ISR). PSAR will mature a small form-factor synthetic aperture radar (SAR) to provide all weather ISR from a high altitude (pseudolite) platform. The small, light, low power system will provide high ground resolution. The PSAR capability will be demonstrated on a high altitude long endurance (HALE) unmanned aerial system. In FY 2019, PSAR demonstrated prototypes on surrogate manned aircraft, completed integration of SAR prototypes on pseudolite aircraft, conducted technical and operational demonstrations and military utility assessment. PSAR will transition to U.S. Navy Program Executive Office, Space, and will close out in FY 2020. | 1.510 | - | - |
| ***Title:*** Quickstrike MK64 – Extended Range (QS64-ER)<br>***Description:*** Previously funded JCTD. QS64-ER supports the National Defense Strategy's focus to enhance joint lethality in contested environments. QS64-ER will provide U.S. Indo-Pacific Command a low-cost wing kit and munitions guidance package to allow for the delivery of maritime mines to a precise location, from a safe stand-off distance. In FY 2019, QS64-ER conducted external release operational demonstration from a B-52; mine placement accuracy and delivery assessment; and military utility assessment. In FY 2020 QS64-ER will transition to the U.S. Navy Program Manager, Ships (PMS-495). JCTD will close out in FY 2020. | 1.789 | - | - |
| ***Title:*** Wingman<br>***Description:*** Previously funded JCTD. Wingman supports the National Defense Strategy's focus on advanced autonomous systems and forward force maneuver. Wingman will project lethality by utilizing unmanned ground vehicles (UGVs) that can maneuver effectively within a mounted formation and engage ahead of and along with manned platforms. The integration of weaponized UGVs into combat elements will provide initial operational stand-off for manned vehicles, enhanced situational awareness, and mitigate the risk of casualties at first contact. In FY 2019, Wingman conducted an operational demonstration of | 4.215 | - | - |

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| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| the first unmanned system certified on the U.S. Army table VI scout gunnery course. Wingman will transition to Next Generation Combat Vehicle program office in FY 2020, and will close out in FY 2020. | | | |
| ***Title:*** Autonomous Aerial Insertion and Resupply into Dense, Urban, Complex Terrain (AAIRDUCT)<br>***Description:*** Previously funded JCTD. AAIRDUCT supports the National Defense Strategy's focus to sustain Joint Force military advantages in austere locations and the DOD's modernization priority for fully networked command, control and communications. AAIRDUCT will integrate and demonstrate multiple low-cost software enhancements into an autonomous precision aerial dispersion system capable of precisely delivering sensors, unmanned ground vehicles (UGV), munitions, humanitarian aid, and equipment into urban environments to reach isolated personnel. In FY 2019, AAIRDUCT completed the final design of the airdrop Multi-Use Aerial Dispersing System and conducted numerous successful airdrop demonstrations. AAIRDUCT will transition to United States Marine Corps (USMC) /Battlefield Resupply Program Executive Office (PEO) in FY 2021 using partner funding. JCTD completed in FY 2019. | 0.725 | - | - |
| ***Title:*** Dialable Effects Munition (DEM)<br>***Description:*** Previously funded JCTD. DEM supports the National Defense Strategy's focus to enhance joint lethality in contested environments. DEM will provide U.S. Central Command and U.S. European Command the capability to modify munition effects while in flight to either increase a munition's effect on target, or to lessen the effect for reduced collateral damage across a wide variety of targets. In FY 2019, DEM performed the critical design review of the system, commenced fabrication of the full-scale prototype; conducted ground tests; completed flight tests for inert and live prototypes; conducted a readiness review; conducted military utility assessment. The DEM JCTD government owned technical data package and test data transitioned to the U.S. Air Force Direct Attack Weapons Branch. JCTD completed in FY 2019. | 2.930 | - | - |
| ***Title:*** Hydra<br>***Description:*** Previously funded JCTD. Hydra supports the National Defense Strategy's focus to enhance forward force maneuver and posture resilience, as well as joint lethality in contested environments. Hydra will provide U.S. Central Command and U.S. European Command the capability to deliver payloads from an undersea platform. Hydra adapts the Defense Advanced Research Projects Agency's (DARPA) Hydra system and Office of Naval Research technologies to solve a CCMD's capability shortfall, and will mature command and control capabilities to deliver the desired payload from an unmanned system. In FY 2019, Hydra delivered a final concept of operations, technical data packages, command and control package, and a military utility assessment. Hydra transitioned the technical package, cyber security artifacts and prototypes to the U.S. Navy Unmanned Maritime Systems Program Office (PMS 406). JCTD completes in FY 2020. | 4.495 | - | - |
| ***Title:*** Electromagnetic Spectrum - Visual Instance of the Environment for Warfighters (EMS-VIEW) | 1.734 | - | - |

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| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Description:*** Previously funded JCTD. EMS-VIEW supports the National Defense Strategy's focus on deepening interoperability and innovative operational concepts. EMS-VIEW provides a joint enterprise framework for Services to share situational awareness, collaboratively plan, and decentralize decision making. EMS-VIEW's first generation framework allows for reliable electromagnetic spectrum (EMS) access and EMS freedom of maneuver for offensive and defensive operations in a multi-domain environment. In FY 2019, EMS-VIEW transitioned the capabilities to the U.S. Marine Corps' Spectrum Services Framework program, the U.S. Army's Electronic Warfare Planning and Management Tool program, and the DoD's Defense Spectrum Office's Global Electromagnetic Spectrum Information System program. JCTD closed in FY 2019. | | | |
| ***Title:*** Mobile Unmanned Air Vehicle Distributed Lethality Airborne Network (MUDLAN)<br><br>***Description:*** Previously funded JCTD. MUDLAN supports the National Defense Strategy's focus on command, control, communications, computers, intelligence, surveillance and reconnaissance (C4ISR) and fully networked command, control and communications modernization. In FY 2018, MUDLAN demonstrated resilient networking that supports high data rate communications across multiple airborne and surface platforms operating in contested environments. In FY 2019, MUDLAN performed flight testing on air, land, and sea platforms to demonstrate military utility of high data rate communications nodes, and demonstrate over-the-horizon, distributed communications capabilities at scale.<br><br>***FY 2020 Plans:***<br>MUDLAN will incorporate and demonstrate a spectrum agility capability to autonomously shift frequency bands to ensure continuous air, land, and sea connectivity in contested electronic warfare environments. MUDLAN will transition the technologies to a U.S. Air Force Air Combat Command program of record. Complete the JCTD.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>JCTD will complete in FY 2020. | 1.650 | 1.750 | - |
| ***Title:*** Undersea Communications With Optical Laser Frequencies (Under C-WOLF)<br><br>***Description:*** Previously funded JCTD. Under C-WOLF directly supports the National Defense Strategy's focus to develop resilient and federated communication and information systems from the tactical to the strategic level. Under C-WOLF provides stealthy and low-latency, optical laser communications (OCOMMS) between undersea systems and air platforms. Using low probability of intercept/low probability of detection technology, the Under C-WOLF JCTD accomplished this by exploiting the air-water-interface (AWI) OCOMMS system and the all-through-water (ATW) OCOMMS system to operate at tactically useful bandwidths, depths, and ranges. The bandwidth for the AWI OCOMMS system provides real-time command and control capability to the submarine. The bandwidth for the ATW OCOMMS system allows an unmanned underwater vehicle to provide results of extensive surveys to a submarine. Both systems together increase operational effectiveness of underwater | 3.720 | 0.800 | - |

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| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| communications in a radio frequency denied, degraded, or contested area, particularly in the U.S. Indo-Pacific Command and U.S. European Command areas of responsibility.<br><br>***FY 2020 Plans:***<br>Under C-WOLF will deliver the AWI system for operational testing in relevant environment; complete the AWI platform integration; conduct laboratory testing of the ATW system; and perform an operational demonstration. Under C-WOLF will transition capabilities to the U.S. Navy Program Executive Office Command, Control, Communications, Computers, and Intelligence. JCTD will complete in FY 2020.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>JCTD will complete in FY 2020. | | | |
| ***Title:*** Expedient and Expeditionary Airfield Damage Repair (E-ADR)<br><br>***Description:*** Previously funded JCTD. E-ADR supports the National Defense Strategy's focus on resilient agile logistics and forward force maneuver. E-ADR will provide an expeditionary low-logistics repair capability that maximizes the use of indigenous materials and readily available equipment. E-ADR will provide an expedient repair capability for aircraft runways in austere and dynamic base locations. In FY 2019, E-ADR conducted technical testing, model development, and tactics, techniques, and procedures (TTP) development.<br><br>***FY 2020 Plans:***<br>E-ADR will refine TTPs, conduct an operational demonstration, and conduct a final military utility assessment of surface capping and crater fill material processing, placement, and compaction. In FY 2020 E-ADR will transition low-equipment count kits optimized for expeditionary transport along with validated TTPs to U.S. Air Force Silver Flag sites and Naval Construction Groups via U.S. Air Force Civil Engineer Center, U.S. Air Force Life Cycle Management Center, Naval Facilities Command and Naval Expeditionary Combat Command. JCTD completes in FY 2021.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>There is no JCTD funding from OSD, transition funding will be provided by IINDOPACOM in FY 2021. | 2.470 | 2.000 | - |
| ***Title:*** Joint Negation of Asymmetric Threats (JNAT)<br><br>***Description:*** JNAT leverages and automates connectivity among existing weather radars and DoD sensors to provide detection of asymmetric threats beyond the National Capital Region (NCR). JNAT will conduct its operational demonstration with multiple radar systems and high power microwave systems, while demonstrating kinetic and non-kinetic negation options. JNAT developed a Counter-Unmanned Aerial System (C-UAS) concept of operations and demonstrates a common operating picture and reporting tool. | 2.391 | 3.275 | - |

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| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***FY 2020 Plans:***<br>JNAT will conduct a cyber-negation demonstration; demonstrate a leave-behind integrated air defense and point defense capability; baseline adaptable C-UAS architecture; and conduct the final military utility assessment. JNAT will transition to the U.S. Navy, the U.S. Air Force Life Cycle Management Center, and the U.S Army Aviation and Missile Research, Development and Engineering Center.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>JCTD will complete in FY 2020. | | | |
| ***Title:*** More Situational Awareness for Industrial Control Systems (MOSAICS)<br>***Description:*** Previously funded JCTD. MOSAICS supports the National Defense Strategy's focus on cyber-space domain defense and improved posture resilience and cybersecurity modernization. MOSAICS will provide cyber defense for supervisory industrial control system for critical warfighting infrastructure. MOSAICS will provide the ability to semi-autonomously detect, analyze, visualize, mitigate and recover from asymmetric attacks on critical infrastructure industrial control systems in mission relevant timeframes. In FY 2019, MOSAICS conducted technology and operational demonstrations to show the end-to-end system integration of the MOSAICS system; conducted a live network and cyber range test at the Joint Information Operations Range (JIOR), and delivered the Advanced Cyber Industrial Control System Tactics, Techniques and Procedures (TTP).<br>***FY 2020 Plans:***<br>Building on FY 2019 accomplishments, MOSAICS will conduct operational demonstrations and deliver leave-behind operational prototypes, validated the Concept of the Operations (CONOPS), training packages, and Unified Facilities Criteria. After the military utility assessment (MUA), MOSAICS will transition to U.S. Navy Naval Facilities Engineering Command for sustainment. Complete the JCTD.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>JCTD will complete in FY 2020. | 1.775 | 1.345 | - |
| ***Title:*** Resilient Autonomy (RA)<br>***Description:*** Previously funded JCTD. RA supports the National Defense Strategy's focus on advanced autonomous systems and machine learning modernization. RA will provide DoD with an innovative autonomous intelligence, surveillance, and reconnaissance system that implements sophisticated air and ground collision avoidance on unmanned air platforms in support of flight safety. RA will demonstrate and field a prototyped sense-and-avoid capability that will allow it to operate in joint airspace without constant human supervision. In FY 2019, RA conducted architecture development, aircraft integration and baseline system testing and evaluation. RA worked with the Federal Aviation Administration (FAA) to identify metrics required for RA flight certification and detailed FAA required milestones. | 4.159 | 2.505 | - |

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| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***FY 2020 Plans:***<br>RA will conduct an operational demonstration of autonomous flight in civilian airspace using detect and avoid technologies to ensure safe separation from other aircraft or obstructions. A rigorous military utility assessment (MUA) will be conducted and FAA certification process established. RA will transition to a United States Marine Corps Unmanned Aerial System program of record. Partner funded work on final reference implementation and certification processes for fully autonomous systems will be completed in FY 2021.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>JCTD will complete in FY 2020. | | | |
| ***Title:*** Special Advanced Low-cost Surveillance Alternative (SALSA)<br>***Description:*** SALSA supports the National Defense Strategy's focus on command, control, communications, computers, intelligence, surveillance and reconnaissance (C4ISR) and fully networked command, control and communications modernization priority. SALSA will develop an operational, affordable prototype sensor that provides on-demand, persistent wide-area surveillance for the Arctic environment. In FY 2019, SALSA selected the site to conduct the operational demonstration (OD), conducted planning and preparation for OD, and finalized communications architecture for flight test.<br>***FY 2020 Plans:***<br>Conduct final OD and military utility assessment (MUA). United States Army Program Executive Office Missiles & Space (PEO M&S) / Cruise Missile Defense System (CMDS) will provide integration partnering with Aviation and Missile Research Development and Engineering Center (AMRDEC) for transitioning of capability. Close out the JCTD.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>JCTD will complete in FY 2020. | 1.290 | 0.005 | - |
| ***Title:*** Sea Launched Army Tactical Missile System (ATACMS) from Shipboard High Mobility Artillery Rocket System (HIMARS) (SLASH)<br>***Description:*** Previously funded JCTD. SLASH supports the National Defense Strategy's focus on joint lethality in contested environments. SLASH will provide a sea launch option for the ATACMS. The JCTD will demonstrate a long range supersonic ballistic surface to surface missile for employment by Expeditionary Strike Groups (ESGs), logistic forces, and U.S. Army (USA) watercraft. In FY 2019, SLASH completed the ATACMS software modification, validation, and verification; conducted fabrication and qualification testing of shipboard blast pad; performed validation of launcher control system adaptability for shipboard use; and conducted missile requisition and integration with HIMARS launcher.<br>***FY 2020 Plans:*** | 2.245 | 1.625 | - |

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| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| SLASH will seek validate live fire testing; complete the missile buildup and software integration; complete the concept of operations documentation; conduct an operational demonstration and final military utility assessment. Upon successful demonstration, SLASH will transition to the U.S. Army, Program Executive Office, Missiles and Space (PEO M&S), ATACMS program of record. The project will complete in FY 2020.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>JCTD will complete in FY 2020. | | | |
| ***Title:*** Unmanned Logistics System-Air (ULS-A)<br>***Description:*** Previously funded JCTD. ULS-A supports the National Defense Strategy's focus on resilient agile logistics, advanced autonomous systems, and machine learning modernization. ULS-A will demonstrate the utility of unmanned aerial system (UAS) prototypes coupled with autonomous technologies to provide an organic, highly autonomous, aerial distribution capability that increases ground maneuver force agility, decreases carrying load, and allows the Joint Commanders to have 'on-call' control of mission essential and time-critical resupply. In FY 2019, ULS-A conducted initial prototype acquisition, and small and medium ULS-A autonomy technical demonstrations. ULS-A incorporated prototype improvements and new autonomy algorithms into the medium ULS-A and conducted a technical demonstration.<br>***FY 2020 Plans:***<br>ULS-A will conduct an operational demonstration of an upgraded autonomy package and UAS advanced capabilities; finalize capability development document (CDD) for Service review; complete medium ULS-A joint concept of operations; and conduct final military utility assessment. In FY 2021 utilizing partner provided funding, ULS-A will continue work on transitioning the small ULS-A operational prototype. The medium ULS-A operational prototype will transition to a U.S. Army and/or NAVAIRSYSCOM program office to inform a Milestone B decision in FY 2022. Medium ULS-A CDD and concept of operations will transition to Services fielding ULS-A. Complete the JCTD in FY 2020.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>JCTD will complete in FY 2020. | 3.973 | 6.950 | - |
| ***Title:*** Integrated Manufacturing Energetic Airframe (IMEA)<br>***Description:*** Previously funded JCTD. IMEA supports the National Defense Strategy's modernization priority for joint lethality in contested environments. IMEA will demonstrate novel structural systems that, when combined with unmanned platforms, provide enhanced lethality and mission flexibility to the Joint Warfighter. In FY 2019, IMEA conducted energetic performance and small scale safety testing; technical demonstration of subsystem components; final design of airframe with energetic components and safe arm technology.<br>***FY 2020 Plans:*** | 4.154 | 4.425 | - |

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| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| IMEA will conduct technical demonstrations of integrated airframe, terminal navigation systems; operational demonstration of integrated platform; and military utility assessment. IMEA JCTD will transition a complete platform data package and prototype to U.S. Army Program Executive Office Missiles and Space Close Combat Weapon Systems and U.S. Navy Submarine Combat and Weapons Control Program Office (PMS-425). Complete the JCTD.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Project will complete in FY 2020. | | | |
| ***Title:*** Automating Indications and Warnings (I&W) for Operational Awareness (REDLINE)<br>***Description:*** Previously funded JCTD. REDLINE supports the National Defense Strategy's focus on military applications of machine learning to gain a competitive military advantage. REDLINE will leverage machine learning to provide CCMDs the ability to conduct automated order of battle in denied areas. In FY 2019, REDLINE delivered improved algorithms and fully automated dissemination of highest confidence alerts as assessed by calibrated performance models. These capabilities improved the initial capability for vetted alerts to facilitate I&W on the Joint Worldwide Intelligence Communications System.<br>***FY 2020 Plans:***<br>REDLINE will scale performance to support global event detection and classification, and provide open applications programming interfaces to facilitate interoperability with other systems.<br>***FY 2021 Plans:***<br>REDLINE will conduct its military user assessment (MUA) in FY 2021 and will transition to the Defense Intelligence Agency's Foundational Intelligence Modernization effort as a program of record.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding decreases in FY 2021 as the program transitions. | 3.495 | 4.000 | 2.000 |
| ***Title:*** Covert Long Dwell Stratospheric Architecture (COLD STAR)<br>***Description:*** FY 2019 new start JCTD. COLD STAR supports the National Defense Strategy's focus on command, control, communications, computers, intelligence, surveillance and reconnaissance (C4ISR) and fully networked command, control and communications modernization priority. Develop and demonstrate a stratollite architecture equipped with autonomous navigation, high fidelity sensors, and on board algorithms to facilitate tasking, collection, processing, exploitation, and dissemination. In FY 2019, COLD STAR conducted preliminary design review and critical design review; conducted initial technical demonstrations (TD).<br>***FY 2020 Plans:*** | 2.470 | 4.000 | 2.000 |

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| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Develop integrated assessment plan; conduct final TD, conduct operational demonstration (OD) with United States Southern Command (USSOUTHCOM).<br><br>***FY 2021 Plans:***<br>Complete integrated assessment plan; conduct final OD, and military utility assessment (MUA) using autonomous navigation and on-board processing on a stratollite. Close out the JCTD.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding decreases in FY 2021 due to transitioning activities. | | | |
| ***Title:*** Directed Energy Survivable Standoff Munitions (DESSM)<br><br>***Description:*** FY 2019 new start JCTD project. DESSM supports the National Defense Strategy's focus on increase lethality, in addition to the DoD's modernization priority concerning directed energy (DE) technologies. DESSM will develop material solutions for protecting standoff munitions against DE countermeasures and weapons. This will enable direct target prosecution of DE weapons or DE-protected targets. DESSM will also utilize hardened munitions to reduce and eliminate weapon effectiveness zones.<br><br>***FY 2020 Plans:***<br>Finalize design; experimentally characterize material and component effects; perform initial integration.<br><br>***FY 2021 Plans:***<br>Complete build; concept of the operations and tactics, techniques, and procedures drafted; begin technical demonstrations, later culminating with a successful military utility assessment in the project's third and final year.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding decreases in FY 2021 due to operational demonstration completing before end of fiscal year, reducing expenditures. | 3.015 | 4.830 | 4.000 |
| ***Title:*** High-altitude Attritable Link Offset Geo-location (HALO-GEO)<br><br>***Description:*** FY 2019 new start JCTD. HALO-GEO supports the National Defense Strategy's focus on developing resilient, survivable networks from the tactical level up to strategic planning. HALO-GEO will provide a resilient alternate positioning, navigation, and timing (A-PNT) solution through a tactically responsive PNT which includes geolocation of adversary forces. HALO-GEO addresses risks of losing situational awareness of adversary positions within denied regions. HALO-GEO will enable joint and coalition operations and situational awareness in contested environments.<br><br>***FY 2020 Plans:*** | 4.645 | 4.900 | 5.100 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603648D8Z / *Joint Capability Technology Demonstration (JCTD)* | **Project (Number/Name)**<br>648 / *Joint Capability Technology Demonstration (JCTD)* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| HALO-GEO will select and develop algorithms; integrate software with prototype hardware for the technical demonstration (TD); deliver a system design review; conduct a preliminary design review and an operational demonstration.<br><br>***FY 2021 Plans:***<br>HALO-GEO will conduct initial flight demonstrations as well as conduct critical design reviews (CDR). The project closes in FY 2021.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>MUA conducted later in fiscal year will increase costs for FY 2021. | | | |
| ***Title:*** Hoku-Kai<br><br>***Description:*** FY 2019 new start JCTD. Hoku Kai supports the USD(R&E) fully networked command, control, and communications modernization priority by providing a secure command, control, and communications platform against continuously growing adversarial threats. The JCTD will deliver assured maritime domain access and targeting using resilient undersea networks.<br><br>***FY 2020 Plans:***<br>In FY 2019, Hoku Kai will begin the JCTD by starting development on CONOPs and TTPs, develop integrations plans, obtain environmental permits at demonstration sites, develop/define standard network interfaces and standards, as well as conduct preliminary designs for the FY 2021 technical and operational demonstrations.<br><br>***FY 2021 Plans:***<br>Hoku Kai will continue to build hardware nodes in FY 2021, conduct integration tests of the nodes in classified locations, develop the end-to-end network architecture, prepare and install the infrastructure at demonstration sites, and complete the delivery of final designs, prototypes, development tasks and network architecture for the JCTD.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>MUA conducted later in fiscal year will increase costs for FY 2022. JCTD completes in FY 2022. | 4.384 | 3.400 | 3.750 |
| ***Title:*** Multi-domain Agile Navigation and timing Network Automation (MANNA)<br><br>***Description:*** FY 2019 new start JCTD. MANNA supports the National Defense Strategy's modernization priority on netted command, control, and communications. MANNA will demonstrate a global positioning system-free positioning, navigation and timing (PNT) laser communications (lasorcom) solution with secure, high-rate exfiltration of intelligence data from an aerial platform to a low earth orbit space asset. In FY 2019, MANNA conducted preliminary design reviews; bench testing; and architecture development.<br><br>***FY 2020 Plans:*** | 5.678 | 5.000 | 2.000 |

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| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603648D8Z / *Joint Capability Technology Demonstration (JCTD)* | **Project (Number/Name)**<br>648 / *Joint Capability Technology Demonstration (JCTD)* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| MANNA will complete aircraft integration; conduct ground-to-ground and air-to-ground technical demonstrations; deliver multiple interoperable communications and PNT terminals.<br>***FY 2021 Plans:***<br>MANNA will conduct space-to-air, space-to-ground technical documentation; operational demonstrations; and military utility assessment (MUA). MANNA will transition the initial capabilities document, testing results of the MUA, verification of models, and three lasercom terminals to the RC-135 program of record via U.S. Air Force Research Laboratory.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Operational demonstration completes before end of fiscal year, reducing expenditures in FY 2021. JCTD completes in FY 2022. | | | |
| ***Title:*** Maritime Centric Skywave Over-the-Horizon Radar (MASOR)<br>***Description:*** FY 2019 new-start JCTD. MASOR supports the National Defense Strategy's focus on command, control, communications, computers, intelligence, surveillance and reconnaissance (C4ISR) and fully networked command, control and communications modernization priority. MASOR provides a near constant wide-area maritime detection and monitoring capability for both air and maritime targets which will degrade an adversary's ability to remain undetected within the southern approach. In FY 2019, MASOR acquired system specifications; site and land acquisition; finalization of transit systems plans; and installation of digital receiver.<br>***FY 2020 Plans:***<br>MASOR will install transmit array and high power amplifier; conduct transit system verification; conduct tracking and control technical demonstration; and installation of skywave over-the-horizon radar (OTHR).<br>***FY 2021 Plans:***<br>MASOR will conduct a full system checkout, testing, verification, validation; operational demonstration; and preparation for military utility assessment (MUA). Upon successful MUA, MASOR will transition to the existing Relocating OTHR Texas system via Forces Surveillance Support Center.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Decrease in FY 2021 funding due to acceleration of development in FY 2020. JCTD concludes in FY 2022. | 3.870 | 5.000 | 1.000 |
| ***Title:*** Resilient Expeditionary Agile Littoral Logistics (REALL)<br>***Description:*** FY 2019 new start JCTD. REALL supports the National Defense Strategy's modernization priority on forward force maneuver and posture resilience. REALL will demonstrate capabilities to enable a distributed network of fuel distribution and logistics nodes in support of emerging operational concepts. These systems will operate within the arc of enemy fires with | 4.470 | 3.000 | 3.000 |

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| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603648D8Z / *Joint Capability Technology Demonstration (JCTD)* | **Project (Number/Name)**<br>648 / *Joint Capability Technology Demonstration (JCTD)* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| significantly less risk than traditional naval platforms due to their distributed nature. In FY 2019, REALL completed platform selection; system functional requirements; system architecture; and modeling and simulation.<br><br>***FY 2020 Plans:***<br>REALL will complete platform design, acquisition and modification; vertical take-off and landing (VTOL) kit design and development; fuel handling system design; military utility assessment (MUA) planning; and technical demonstration.<br><br>***FY 2021 Plans:***<br>REALL will complete systems integration and testing; tactics, techniques, and procedures; and final MUA. REALL will transition the platform, VTOL kit fuel subsystem technical documentation to Naval Facilities Engineering Command (NAVFAC) Expeditionary Programs Office Sealift program; Naval Beach Group inventories via NAVFAC Expeditionary Programs Office; and Office of the Chief of Naval Operations, Expeditionary Warfare (OPNAV N95) and Strategic Mobility and Combat Logistics (OPNAV N42). Complete the JCTD.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding remains constant throughout the JCTD due to varying partner funding contributions in FY 2019, FY 2020, and FY 2021. JCTD concludes in FY 2022. | | | |
| ***Title:*** UHF Legacy Extension (ULX)<br><br>***Description:*** FY 2019 new start JCTD. ULX supports the National Defense Strategy's focus on developing resilient, survivable networks from the tactical level up to strategic planning. ULX will address legacy communication systems across the DoD currently lacking resilience in congested and contested environments. These systems face near term risk of shortfalls in UHF channel capacity while wideband code division multiple access (WCDMA) radios are fielded. ULX will resolve the legacy UHF shortfall by increasing total legacy UHF channel capacity worldwide. ULX will reduce legacy UHF channel contention among users by leveraging Mobile User Objective System (MUOS) spot beams for regional channel assignment. ULX provides resiliency and eliminates legacy UHF interference through innovative ground signal processing.<br><br>***FY 2020 Plans:***<br>ULX will develop concept of the operations and tactics, techniques, and procedures; develop user-friendly frequency planning system and channel plan; conduct technical demonstration (TD); and install operational prototype.<br><br>***FY 2021 Plans:*** | 4.395 | 2.250 | 1.050 |

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| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603648D8Z / *Joint Capability Technology Demonstration (JCTD)* | **Project (Number/Name)**<br>648 / *Joint Capability Technology Demonstration (JCTD)* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Conduct operational demonstration (OD) and military utility assessment (MUA). ULX will transition operational prototype hardware and software to the MUOS program of record (PoR). The operational prototype will be transitioned in place at the Wahiawa, HI Radio Access Facility to the MUOS PoR.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Operational demonstration completes before end of fiscal year, reducing expenditures. JCTD concludes in FY 2022. | | | |
| ***Title:*** JCTD Concept Development/Developmental and Operational Prototypes<br><br>***Description:*** Continually funded effort. This funding allocation is to provide funding for the new start JCTDs. The JCTD program will select new projects as developmental and operational prototypes, in alignment with the co-developed mission focused areas which include, but are not limited to: time-sensitive targeting (TST), advanced electronic warfare (AEW), integrated fires (IF), and fully networked command, control and communications (FNC3). Senior representatives from each CCMD, Service, and Joint Staff will participate in the submission, initial review, and down-selection of JCTDs. Final selections will be reviewed by the Assistant Directors for the DOD Modernization Areas and USD(R&E) executive leadership before a final recommendation for Congressional approval is made. Selected projects will leverage networks within the global research and engineering enterprise to include government labs and integration facilities, depots, academia, as well as traditional and non-traditional technology providers. Prototypes will utilize best practices to satisfy joint and cross-cutting needs that directly address the modernization priorities and the CCMD's technology/capability gaps. The JCTD office will work with the Services to identify means to streamline prototype transition into the acquisition systems where appropriate.<br><br>***FY 2020 Plans:***<br>Fund the follow-on efforts for projects started in FY 2019. Select advanced prototyping activities as new starts in FY 2020 that support the National Defense Strategy and the USD(R&E) priorities.<br><br>***FY 2021 Plans:***<br>Fund the follow-on efforts for projects started in FY 2020. Select advanced prototyping activities as new starts in FY 2021 that support the National Defense Strategy and the USD(R&E) priorities.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Program Element baseline show an increase from FY 2020 to FY 2021. This line is dedicated to new start projects. During the years of execution (FY 2019 / FY 2020), once projects are selected, funding is no longer accounted in this line and is accounted for in projects detailed separately throughout the R-2A. The reality is that total funding supporting new start projects remains constant, at approximately 30 percent of the annual appropriation. | 0.000 | 11.549 | 43.549 |
| ***Title:*** Combatant Commander (CCMD) Support, Capability Transition and Strategic Project Operational Management | 10.980 | 17.250 | 18.003 |

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| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603648D8Z / *Joint Capability Technology Demonstration (JCTD)* | **Project (Number/Name)**<br>648 / *Joint Capability Technology Demonstration (JCTD)* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Description:*** Previously funded effort. This effort is comprised of three programs that support the entire JCTD Program. The three programs are (1) CCMD direct liaison support, (2) JCTD pre-transition and (3) Program Integration Office for execution of select, classified projects. (1) CCMD direct liaison support: The CCMDs are essential in specifying capability needs, project identification, demonstration venues, military utility assessment, and transition of JCTDs. The JCTD program provides direct support to CCMDs enabling them to provide an on-site JCTD operational manager. (2) JCTD pre-transition: In some cases, Service or Agency partner transition funding is not available for one to two years following the JCTD demonstration phase. In such cases, where there is a clear transition and the need to sustain the capability for a short time prior to availability of Service or Agency transition funds, the JCTD pre-transition funds may be used to meet that need. (3) Program Integration Office: Executes a select number of highly classified projects in areas such as electronic miniaturization, electronic countermeasures, advanced mobile ad hoc network communications, space situational awareness intelligence surveillance and reconnaissance, sensor platforms and communications, and persistence surveillance.<br><br>***FY 2020 Plans:***<br>Provide CCMD direct participation to enable CCMD staff participation in identifying and executing developmental and operational prototypes. Identify and execute projects selected by the technology assessment panels. Sustain selected projects until program of record funds are received. Execute a limited number of classified projects' military utility assessments.<br><br>***FY 2021 Plans:***<br>Provide CCMD direct participation to enable CCMD staff participation in identifying and executing developmental and operational prototypes. Identify and execute projects selected by the technology assessment panels. Sustain selected projects until program of record funds are received. Execute a limited number of classified projects' military utility assessments.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Slight increase from FY 2020 to FY 2021 is due to inflation of multi-year contracts. | | | |
| **Accomplishments/Planned Programs Subtotals** | 102.494 | 89.859 | 85.452 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Successful JCTDs can transition to acquisition via one of several methods:

- The JCTD addresses a documented capability gap in an existing program of record (PoR). The existing PoR can acquire, further mature, sustain, and provide the capability under existing program documentation.

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| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603648D8Z / *Joint Capability Technology Demonstration (JCTD)* | **Project (Number/Name)**<br>648 / *Joint Capability Technology Demonstration (JCTD)* |

- The capabilities address capability gaps that naturally fit with an existing PoR, but program documentation addressing the new capabilities does not exist. In these cases, existing PoR documentation (such as the capabilities development document (CDD) or capabilities production document (CPD)) is revised to include the new capabilities from the JCTD, and the JCTD capabilities transition to the PoR.
- The capabilities address a current operational need without requiring PoR changes. In these cases, the JCTD capabilities may transition directly to operational use, with sustainment (operations and maintenance) funding arranged through the gaining command.
- The results of JCTD can be used to inform research and engineering, or validate a joint requirement per the Joint Capabilities Integration and Development System. This includes identification of the need through development of an initial capability description (ICD) document or accelerating the development of a CDD or CPD to establish a new PoR.
- The capabilities may be widely applicable commodity products, useful to many commands. In these cases, the commodity products are listed on General Services Administration schedule, and made available for purchase by any commands needing the capability.

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
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| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603662D8Z / *Networked Communications Capability* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 12.369 | 12.291 | 2.858 | 5.882 | - | 5.882 | 5.946 | 5.994 | 6.072 | 6.135 | Continuing | Continuing |
| 663: *Network Communications Analysis* | 12.369 | 12.291 | 2.858 | 5.882 | - | 5.882 | 5.946 | 5.994 | 6.072 | 6.135 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

Currently fielded satellite communications (SATCOM), terrestrial, and Tactical Data Links (TDLs) will be adversely affected during operations in contested Anti-Access/ Area-Denial (A2/AD) environments. The primary threat is from sophisticated electronic warfare capable of advanced jamming and signal collection techniques that are rapidly evolving to become more capable and agile. Department of Defense (DoD) advances in smart sensors and smart weapons have an urgent need for more resilient networks than the tactical data links of today. In FY 2016, the Network Communications Capability Program (NCCP) returned with a new focus on developing enabling technologies for Joint assured communications networks. The goals of this program are: to mitigate degradation across battlespace tiers and domains, and to provide agility that will support the mission needs of Joint Functional Component Commanders, Joint Force Commanders, and deployed forces.

The DoD's current TDLs platforms and capabilities are not sufficiently protected from emerging adversary threats and contain insufficient capacity for future needs. In order to enable the promise of net-centric operations for the warfighter, the next generation of airborne, surface, and ground tactical networks must provide greater affordability, higher network capacity, greater durability against electronic attack, better network connectivity, and faster response times to the changing demands from airborne, maritime, and ground users. Many line-of-sight (LOS), beyond LOS, and SATCOM waveforms have been integrated onto platforms for various missions. These waveforms necessarily exhibit tradeoffs in target performance attributes including capacity, latency, protection, and complexity. As a result, no single waveform capability will be able to satisfy all emerging mission needs emphasizing the need for interoperability and software-defined waveforms. The challenge is to understand the essential needs of the users, avoid needless redundancy, develop affordable capabilities, and integrate separate capabilities into a cohesive network. This research will develop transformative technologies to ensure performance in contested A2/AD environments by focusing on future communications networks that are a "leap ahead" of today's capabilities.

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| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603662D8Z / *Networked Communications Capability* |

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 12.667 | 2.858 | 2.912 | - | 2.912 |
| Current President's Budget | 12.291 | 2.858 | 5.882 | - | 5.882 |
| Total Adjustments | -0.376 | 0.000 | 2.970 | - | 2.970 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | -0.374 | - | | | |
| • Other Adjustments | -0.002 | - | 2.976 | - | 2.976 |
| • Economic Assumption | - | - | -0.006 | - | -0.006 |

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| Appropriation/Budget Activity<br>0400 / 3 | R-1 Program Element (Number/Name)<br>PE 0603662D8Z / *Networked Communications Capability* | Project (Number/Name)<br>663 / *Network Communications Analysis* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 663: *Network Communications Analysis* | 12.369 | 12.291 | 2.858 | 5.882 | - | 5.882 | 5.946 | 5.994 | 6.072 | 6.135 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

In a contested environment, especially when conducting forward operations, platforms face a significant electronic warfare threat. The primary threat is from advanced jamming, signal collection, and geolocation techniques that are rapidly evolving to become more capable and agile. DoD advances in smart sensors and weapons demand robust tactical waveforms and networks with greater capacity but lower cost than communication links of today.

The Future Autonomous Battlespace Radio Frequency with Integrated Communications (FABRIC) program is developing next-generation communications-layer architecture for tactical networks for operations in anti-access/area denial (A2/AD) threat environments. This architecture will deliver capacity and affordability to enable future smart sensors and smart weapons. The network architecture is flexible enough to support Commander's Intent in any mission, environment, operating tactical platform, and weapon system under various threat conditions. FABRIC's efforts focus on developing advanced component technologies, such as Anti-Jam (AJ), Low Probability of Intercept (LPI), Low Probability of Detection (LPD) waveforms; adaptive antenna technologies (transmit/receive/nulling); cyber hardening; and advanced routing to ensure Quality of Service..

Based on the developed thresholds and objectives for the required network architecture, the specific advanced component technologies were prioritized and form the foundation of the FABRIC design. Through simulation and field experimentation, FABRIC is verifying the technology in operationally relevant environments against representative threats, and facilitates the migration and transition of these technologies to service platforms, radios, and other combat mission systems.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Future Autonomous Battlespace RF with Integrated Communications (FABRIC) | 12.291 | 2.858 | 5.882 |
| ***Description:*** The FABRIC program develops hardware (HW), software (SW), and algorithms to advance network technologies creating a robust tactical network to operate in contested A2/AD environments. The project investigates and develops flexible, high performance, and affordable technologies for the tactical network, supporting capability changes as a mission progresses from phase to phase. The project develops and matures technologies to support direct transition of the algorithms, prototype implementations, waveform improvements, and system design improvements to radio, waveform, and weapon systems programs managed by each military department.<br><br>***FY 2020 Plans:***<br>HW and SW Development<br>- Complete design, fabrication, and test of initial FABRIC processor.<br>- Design backboard that will integrate the processor with other FABRIC components<br>- Fabricate/procure sufficient quantities of HW components required to implement 2021 system field test. | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
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| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603662D8Z / *Networked Communications Capability* | **Project (Number/Name)**<br>663 / *Network Communications Analysis* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| - Complete unit testing and integration testing of baseline software.<br><br>System Integration<br>- Integrate and test sensor backboard assembly.<br>- Integrate and test FABRIC brain assembly.<br>- Integrate beamforming, modem, and networking SW onto FABRIC architecture.<br><br>Scenarios and Transition Planning<br><br>Prototyping, Lab, and Field Testing<br>- Refine/update all component, subsystem, and system lab and field test plans.<br>- Continue HW/SW unit testing and sub-system, and system integration testing and planning in preparation for system field test. | | | |
| ***FY 2021 Plans:***<br>HW and SW Development<br>- Make necessary HW/SW modification to address any gaps arising from 2021 system field test.<br>- Incorporate autonomous system control to enable manned-unmanned teaming (MUM-T).<br>- Optimize support for AI/ML.<br><br>System Integration<br>- Integrate all HW components into FABRIC systems and integrate FABRIC systems onto platforms for system field test.<br><br>Prototyping, Lab, and Field Testing<br>- Complete lab/static testing of FABRIC systems on platforms prior to system field test.<br>- Complete system field test.<br>- Incorporate brigade and humanitarian assistance/disaster recovery (HADR) support utilizing many autonomous systems.<br><br>Scenarios and Transition Planning<br>- Perform scenario simulations to support transition planning to services and agencies. | | | |
| ***FY 2020 to FY 2021 Increase/Decrease Statement:*** | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
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| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603662D8Z / *Networked Communications Capability* | **Project (Number/Name)**<br>663 / *Network Communications Analysis* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Delayed M&S until FY 2021 due to limited funding; delayed system integration and platform integration, until FY 2021, due to unavailability of packaged FABRIC processor until Summer FY 2020. Increased funding in FY 2021 supports increases in system testing and validation in operationally representative scenarios, as needed to achieve TRL6 and transition to the Warfighter. | | | |
| **Accomplishments/Planned Programs Subtotals** | 12.291 | 2.858 | 5.882 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

The FABRIC project will address capability gaps for Joint tactical data link networks by developing the technologies that the Military can incorporate in future platform and radio acquisitions. The proposed experimentation, with field demonstrations and modeling, will increase the Technology Readiness Level of critical technology components, suitable for transition to acquisition programs. This will also provide DoD leadership with the supporting technical and cost details to identify candidate "building blocks" for timely incremental improvements.

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| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603680D8Z *I Defense Wide Manufacturing Science and Technology Program* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 782.364 | 171.749 | 197.397 | 93.817 | - | 93.817 | 96.042 | 95.490 | 98.331 | 99.924 | Continuing | Continuing |
| 680: *Manufacturing Science and Technology Program* | 174.930 | 22.328 | 30.162 | 31.840 | - | 31.840 | 32.656 | 32.867 | 33.625 | 34.309 | Continuing | Continuing |
| 350: *Manufacturing Innovation Institutes* | 607.434 | 134.421 | 167.235 | 61.977 | - | 61.977 | 63.386 | 62.623 | 64.706 | 65.615 | Continuing | Continuing |
| 607: *National Security Technology Accelerator Program* | - | 15.000 | 0.000 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

The Defense-wide Manufacturing Science and Technology (DMS&T) program is the joint, defense-wide component of the DoD Manufacturing Technology (ManTech) Program directed in Title 10 U.S.C. Section 2521. DMS&T also supports many of the recommendations in the Executive Order Report "Assessing and Strengthening the Manufacturing and Defense Industrial Base and Supply Chain Resiliency of the United States" September 2018.

The objective of the DMS&T program is to increase the speed at which innovation, inventions, and scientific discoveries are turned into equipment and capabilities through advances in manufacturing technologies and processes. The DMS&T program has created and is sustaining a manufacturing innovation ecosystem across the two project codes in this Program Element (PE): P680 OSD Manufacturing Technology and P350 the DoD Manufacturing USA Institutes.

Project Code (P) 680 OSD Manufacturing Technology:
The OSD Manufacturing Technology (ManTech) program focuses on cross-cutting defense manufacturing advancements and stimulates early development of manufacturing processes and enterprise business practices.

P350 DoD Manufacturing USA Innovation Institutes:
This project supports the eight DoD-led manufacturing innovation institutes that are part of the Manufacturing USA network of manufacturing innovation institutes, plus the stand-up of a new Synthetic Biology Manufacturing Innovation Institute, in accordance with current mission requirements. The technology focus areas are: (1) additive manufacturing; (2) digital manufacturing, design and manufacturing cybersecurity; (3) lightweight metals; (4) integrated photonics; (5) flexible hybrid electronics; (6) smart fibers and textiles; (7) advanced tissue biofabrication; (8) advanced robots for manufacturing; and (9) synthetic biology. Each institute is a public/private partnership that matches DoD funding at a one to one ratio or greater and has a consortium of members from industry and academia to mature manufacturing processes, build out the supporting ecosystems, and provide manufacturing education and workforce development. The ecosystem includes small and medium manufacturers and state-of-the-art pilot facilities.

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603680D8Z *I Defense Wide Manufacturing Science and Technology Program* |

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 174.489 | 96.397 | 79.543 | - | 79.543 |
| Current President's Budget | 171.749 | 197.397 | 93.817 | - | 93.817 |
| Total Adjustments | -2.740 | 101.000 | 14.274 | - | 14.274 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | 0.000 | 101.000 | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | -2.710 | - | | | |
| • Increase for Synthetic Biology Manufacturing Innovation Insitute | - | - | 15.000 | - | 15.000 |
| • Economic Assumption | - | - | -0.077 | - | -0.077 |
| • Other Adjustments | -0.030 | - | -0.649 | - | -0.649 |

| Congressional Add Details ($ in Millions, and Includes General Reductions) | FY 2019 | FY 2020 |
|---|---|---|
| **Project:** 350: *Manufacturing Innovation Institutes* | | |
| Congressional Add: *Manufacturing Engineering Programs* | 5.000 | 5.000 |
| Congressional Add: *Manufacturing Institutes* | 7.512 | 59.000 |
| Congressional Add: *Advanced Manufacturing* | 30.000 | - |
| Congressional Add: *Program Increase* | - | 20.000 |
| Congressional Add: *HPC enabled advanced manufacturing* | - | 17.000 |
| Congressional Add Subtotals for Project: 350 | 42.512 | 101.000 |
| **Project:** 607: *National Security Technology Accelerator Program* | | |
| Congressional Add: *National Security Technology Accelerator Program* | 15.000 | - |
| Congressional Add Subtotals for Project: 607 | 15.000 | - |
| Congressional Add Totals for all Projects | 57.512 | 101.000 |

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| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603680D8Z *I Defense Wide Manufacturing Science and Technology Program* |

**Change Summary Explanation**

The FY 2019 Congressional Add for $60.250 million supports the acceleration of efforts for: manufacturing engineering programs; manufacturing innovation institutes; advanced manufacturing; and National Security Technology Accelerator.

The FY 2020 Congressional Add for $101.000 million supports the following: manufacturing engineers programs; manufacturing innovation institutes; advanced manufacturing; HPC enabled advanced manufacturing, manufacturing cyber security and silicon based lasers.

The increase in FY 2021- FY 2025, P350 Manufacturing Innovation Institutes, is for a Synthetic Biology Manufacturing Innovation Institute. The total funding is $92.000 million.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
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| Appropriation/Budget Activity<br>0400 / 3 | R-1 Program Element (Number/Name)<br>PE 0603680D8Z / *Defense Wide Manufacturing Science and Technology Program* | Project (Number/Name)<br>680 / *Manufacturing Science and Technology Program* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 680: *Manufacturing Science and Technology Program* | 174.930 | 22.328 | 30.162 | 31.840 | - | 31.840 | 32.656 | 32.867 | 33.625 | 34.309 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

The OSD ManTech program concentrates on cross-cutting defense manufacturing needs that are beyond the ability of a single service to address. In support of this mission the OSD ManTech program invests in broad technology initiatives in: Advanced Electronics and Optics, Advanced Materials and Composites, Advanced and Emerging Manufacturing Processes, and Advanced Energetics Manufacturing.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Advanced Electronics and Optics | 10.720 | 9.352 | 9.010 |
| ***Description:*** Description: Advanced Electronics and Optics is a series of efforts addressing advanced manufacturing technologies for a wide range of applications such as sensors, radars, power generation, switches, and optics for defense applications. Focal points are productivity and efficiency gains in the defense manufacturing base to accelerate delivery of technical capabilities to impact current warfighting operations, and manufacturing technologies to reduce the cost, acquisition time and risk of our major defense acquisition programs. Future efforts will focus on advances in fuel cells, lasers, enhanced acuity micro-displays, and transparent ceramics for opto-mechanical and armor applications.<br><br>***FY 2020 Plans:***<br>FY 2020 Plans: Continue projects that are addressing manufacturing needs for electronic and optics related technologies. Light-weight Gradient Index Lenses (GRIN Lenses) and Circular Polarizers for Color Day Cameras will each be executing Year 2 of 3 for their efforts, while Portable X-Ray Detectors for Dismounted Soldier, Low-SWaP Spectral Beam Combiners and MEMS Navigation Grade Inertial Sensors will receive their final year of funding to carry them through the remainder of their efforts. Program will solicit proposals from Department of Defense workforce to help address manufacturing constraints in several technology fields.<br>***FY 2021 Plans:***<br>Utilize the annual project call to select and initiate projects that support the National Defense Strategy and DoD modernization priorities. Additionally, GRIN Lenses and Circular Polarizers for Color Day Camera projects will be in their final year of funding.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The level of effort is consistent between FY 2020 and FY 2021. Small changes reflect minor budget fluctuations. | | | |
| ***Title:*** Advanced Materials and Composites | 4.724 | 10.490 | 13.110 |

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| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603680D8Z / *Defense Wide Manufacturing Science and Technology Program* | **Project (Number/Name)**<br>680 / *Manufacturing Science and Technology Program* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Description:*** Advanced Materials and Composites is a series of efforts addressing advanced manufacturing technologies for a wide range of materials such as composites, metals, ceramics, nanomaterials, and metamaterials. Through productivity and efficiency gains, these manufacturing technologies will accelerate delivery of technical capabilities to impact current warfighting operations, while reducing the cost, acquisition time and risk of our major defense acquisition programs. Advanced materials manufacturing technologies undergoing development include materials for ballistic survivability and ballistic protection, survivability and rapid fabrication of structural components.<br><br>***FY 2020 Plans:***<br>Program will fund the final year of the Fabrication of Non-Eroding Metallic Throat and Oxide-Oxide Ceramic Matrix Composite projects. The Oxide-Oxide Ceramic Matrix Composite project will be transitioning from the DMS&T ManTech program to the Army ManTech program to help further address Army-specific needs. The Manufacturing of Carbon-Carbon Composites for Hypersonic Applications (MOC3HA) initiative will be entering Year 3 of 5 and focus on tackling the domestic manufacturing base for carbon-carbon materials. Hypersonic Radio-Frequency (RF) Seeker Window project will be kicked off and funded for Year 1 of 3. Program will solicit proposals from Department of Defense workforce to help address manufacturing constraints in several technology fields.<br><br>***FY 2021 Plans:***<br>Utilize the annual project call to select and initiate projects that support the National Defense Strategy and DoD modernization priorities. The MOC3HA initiative will be funded for Year of 5 and the Hypersonic RF Seeker Window project will enter Year 2 of 3.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The FY 2021 increase in funding supports the MOC3HA and Hypersonic RF Seeker Window projects to address Hypersonic-related manufacturing constraints in the defense manufacturing industry. | | | |
| ***Title:*** Advanced and Emerging Manufacturing Processes | 1.784 | 5.010 | 5.260 |
| ***Description:*** Advanced and Emerging Manufacturing addresses advanced manufacturing technologies and business practices for defense applications. Key focus areas include direct digital (or additive) manufacturing, advanced manufacturing enterprise, machining, robotics, assembly, and joining. Projects selected will accelerate delivery of technical capabilities to impact current warfighting operations while reducing cost, acquisition time, and risk of major defense acquisition programs.<br><br>***FY 2020 Plans:***<br>The Novel Printed Countermeasures, Fabrication of Non-Eroding Metallic Throat and Magnesium Oxide for Thermal Batteries projects will be entering their final year of funding. The Fabrication of Non-Eroding Metallic Throat project is hoping to execute a hot-fire test of their product in the August/September 2020 timeframe. Additionally, the Novel Printed Countermeasures project | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
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| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603680D8Z / *Defense Wide Manufacturing Science and Technology Program* | **Project (Number/Name)**<br>680 / *Manufacturing Science and Technology Program* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| is hoping to perform a flight test of their product at China Lake, CA in the June 2020 timeframe. A new start for FY 2020 is the Lightweight Hydrogen Fuel Cell project that will kick-off Year 1 of 3. Program will solicit proposals from Department of Defense workforce to help address manufacturing constraints in several technology fields.<br>***FY 2021 Plans:***<br>Utilize the annual project call to select and initiate projects that support the National Defense Strategy and DoD modernization priorities. Foamed Celluloid Materials project will be entering the final year of funding and the Lightweight Hydrogen Fuel Cell project will execute Year 2 of 3.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The level of effort is consistent between FY 2020 and FY 2021. Small changes reflect minor budget fluctuations. | | | |
| ***Title:*** Advanced Energetics Manufacturing<br>***Description:*** Advanced Energetics Manufacturing develops improved manufacturing capabilities for safer, low cost, high quality production of existing and newly developed ingredients and composites used in energetic materials production. Techniques such as additive manufacturing, microfluidics, continuous processing, resonant acoustic mixing, robotics, etc. are developed for production of critical energetics and supporting ingredients ensuring Department access to these materials and enabling the development of new, highly advanced energetic systems for improved range and performance.<br>***FY 2020 Plans:***<br>The Stabilized Alpha Alane project will enter its final year of execution, while the Lead-Free Primary Explosive DBX-1 and High Density Reactive Material projects will be continuing their efforts. Advanced Mixing for Infrared Countermeasures will be initiated in FY 2020 as a 2-year project that is being performed in tandem with Navy ManTech. Program will solicit proposals from Department of Defense workforce to help address manufacturing constraints in several technology fields.<br>***FY 2021 Plans:***<br>Utilize the annual project call to select and initiate projects that support the National Defense Strategy and DoD modernization priorities. The Lead-Free Primary Explosive DBX-1, High Density Reactive Materials and Advanced Mixing for Infrared Countermeasures projects will be in their final year of execution in FY 2021.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The funding level in FY 2021 is consistent with funding needed to incrementally funded existing projects and begin new advanced energetic manufacturing efforts. | 5.100 | 5.310 | 4.460 |
| **Accomplishments/Planned Programs Subtotals** | 22.328 | 30.162 | 31.840 |

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| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603680D8Z / *Defense Wide Manufacturing Science and Technology Program* | **Project (Number/Name)**<br>680 / *Manufacturing Science and Technology Program* |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

N/A

**D. Acquisition Strategy**

ManTech projects are awarded competitively through the DoD Service Laboratories. Approximately 1/3 of the total active topics are awarded to new initiatives annually.

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| Appropriation/Budget Activity<br>0400 / 3 | R-1 Program Element (Number/Name)<br>PE 0603680D8Z / *Defense Wide Manufacturing Science and Technology Program* | Project (Number/Name)<br>350 / *Manufacturing Innovation Institutes* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 350: *Manufacturing Innovation Institutes* | 607.434 | 134.421 | 167.235 | 61.977 | - | 61.977 | 63.386 | 62.623 | 64.706 | 65.615 | Continuing | Continuing |

**Note**

The increase in Project Code (P) 350 funds are for the new Synthetic Biology Manufacturing Innovation Institute that focused on materials production. The total funding is $92.000 million (FY 2021 - FY 2025).

**A. Mission Description and Budget Item Justification**

DoD supports nine manufacturing innovation institutes that are public/private partnerships that address both commercial and defense manufacturing needs within specific, defense-relevant technology areas and receive active participation and support from the military departments and defense agencies. The institutes' flexible business models and strong focus on enabling highly collaborative R&D are catalyzing important new organizational relationships across government, industry and academia. This is bringing together both traditional defense and non-traditional sectors, accelerating key innovation cycles and expanding U.S. industrial capability and assisting in creating resilient supply chains that will support innovative defense products.

DoD's nine institutes are: (1) America Makes (Additive Manufacturing); (2) MxD – Manufacturing times Digital (Digital Manufacturing, Design and Cybersecurity); (3) LIFT – Lightweight Innovations For Tomorrow (Lightweighting Innovations – materials and processes); (4) American Institute for Manufacturing Integrated Photonics (Device Manufacturing and Packaging); (5) NextFlex Manufacturing Innovation Institute (Flexible Hybrid Electronics Manufacturing); (6) Advanced Functional Fabrics of America (Smart Fibers and Textiles); (7) BioFabUSA Manufacturing Innovation Institute (regenerative tissue manufacturing); (8) Advanced Robotics Manufacturing (Smart Collaborative Robotics for Manufacturing); and (9) Synthetic Biology Manufacturing Innovation Institute, which is new and being stood up in accordance with current mission requirements.

The funding provided for the manufacturing innovation institutes is focused in the following areas:

• Conducting (or funding) pre-competitive applied research and development projects to reduce the cost, time, and technical uncertainty related to new manufacturing technologies and to improve existing technologies, processes, and products.
• Developing and implementing education, training, and workforce recruitment courses, materials, and programs.
• Developing innovative methodologies and practices for supply chain integration and introduction of new technologies into supply chains.
• Engaging with small and mid-sized manufacturers, including women and minority-owned manufacturing enterprises, and larger-sized manufacturing firms.

While each institute has a different model there are similar in the following ways:

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• Each institute is a public-private partnership with representatives from industry, academia, state and local governments, and the DoD that co-invest in world-leading technologies and capabilities.
• Each institute provides facilities needed to allow collaborative, precompetitive development of promising technologies and to promote the creation of stable and sustainable innovation ecosystems for advanced manufacturing.
• The partnerships forming the institutes must commit non-federal resources that equal or exceed the federal

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• Conducting (or funding) pre-competitive applied research and development projects to reduce the cost, time, and technical uncertainty related to new manufacturing technologies and to improve existing technologies, processes, and products.
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• Developing innovative methodologies and practices for supply chain integration and introduction of new technologies into supply chains.
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While each institute has a different model there are similar in the following ways;

• Each is a public-private partnership with representatives from industry, academia, state and local governments, and the DoD that co-invest in world-leading technologies and capabilities.
• Each institute provides facilities needed to allow collaborative, precompetitive development of promising technologies and to promote the creation of stable and sustainable innovation ecosystems for advanced manufacturing.
• The partnerships forming the institutes must commit non-federal resources that equal or exceed the federal contribution during a five- to seven-year establishment period.
• Each institute is part of the Manufacturing USA network.
contribution during a five- to seven-year establishment period.
• Each institute is part of the Manufacturing USA Network.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** America Makes (Additive Manufacturing) | 2.000 | 4.956 | 4.280 |
| ***Description:*** America Makes' mission is to accelerate the adoption of Additive Manufacturing in the United States industrial base. Additive manufacturing (i.e., "3D printing") is a process of joining materials to make objects from 3D model data, usually layer upon layer, as opposed to subtractive manufacturing methodologies such as traditional machining. Additive manufacturing is benefitting the DoD by enabling lifecycle cost savings and enhanced capabilities including: distributing supply chains to get the right part in the right place at the right time, improving mission readiness by producing work aids in sustainment depots and | | | |

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| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603680D8Z / *Defense Wide Manufacturing Science and Technology Program* | **Project (Number/Name)**<br>350 / *Manufacturing Innovation Institutes* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| replacing long-lead time and out of production spares, and by enhancing lethality through production of lighter weight and higher performing parts than could be achieved with traditional manufacturing.<br><br>***FY 2020 Plans:***<br>Complete technical performance of all projects awarded in FY 2018 and make results available in the knowledge management system. Continue leading initiatives to define and document industry additive manufacturing standards. Continue implementing new processes for transitioning technologies developed by the institute. Continue education and workforce training initiatives and move toward industry recognized labor certifications. Award and begin execution of technical projects addressing affordability of additive manufacturing. Continue to host events across the US to convene industry, academia, and public partners in AM.<br><br>***FY 2021 Plans:***<br>Initiate a new long-term agreement between America Makes and the DoD to accelerate adoption of Additive Manufacturing within industry and government, resulting in revamped staffing and increased stakeholder engagement. Enhance the model of technical excellence through projects by synthesizing those project outcomes and deliverables with industry trends and other outside information sources to become a strategic leader in the Additive Manufacturing community.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Level of effort is consistent between FY 2020 and FY 2021. Small changes reflect budget fluctuation. | | | |
| ***Title:*** MxD – Manufacturing times Digital (Digital Manufacturing, Design and Cybersecurity)<br><br>***Description:*** MxD focuses on the implementation of the Digital Thread, the unencumbered flow of data across the lifecycle of a manufactured product encompassing data from design, production, supply, sourcing, inventory, assembly, quality, maintenance and sustainment. It includes the analysis of this data to reduce the time and cost of bringing new products to market, the elimination of barriers between design, manufacturing and sustainment by using both product data and process data in a way that is seamless and transparent. MxD's focus areas are: (1) Future Factory, 2) Agile and Resilient Supply Chain, 3) Cyber Security for Manufacturing, and 4) Design, Product Development and System Engineering.<br><br>***FY 2020 Plans:***<br>Initiate projects identified in the 2020 Strategic Investment Plan. Develop a set of workshops & hands-on training programs through the National Center for Cybersecurity in Manufacturing focused on cybersecurity theory & practice for the DoD Organic Industrial Base. Increase DoD Organic Industrial Base utilization of Discrete/Assembly/Cybersecurity testbeds for rapid technology development and assessment of scalability into the DoD materiel enterprise. Significantly scale up commercialization, skill development and workforce development efforts from research projects and relationships with other government agencies.<br><br>***FY 2021 Plans:*** | 1.750 | 4.954 | 4.280 |

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| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Continue to assist the DoD to achieve the digital engineering and advanced manufacturing goals of the DoD Modernization Strategy, lead efforts in preparing the digital workforce within government, industry, and academia, advance the cybersecurity of the manufacturing supply chain, and drive new digital manufacturing technologies and the digital capabilities of the U.S. manufacturing base. MxD will also advance new deployable technology development that can support the U.S. warfighter while helping equip U.S. small- and medium-sized manufacturers with the tools and skills they need to innovate, compete globally, and win.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Level of effort is consistent between FY 2020 and FY 2021. Small changes reflect budget fluctuation. | | | |
| ***Title:*** LIFT – Lightweight Innovations for Tomorrow (Lightweighting Innovations – materials and processes) | 4.500 | 4.954 | 4.280 |
| ***Description:*** Advanced lightweight metals retain properties comparable to heavier, traditional materials, and can enable weight reduction in a variety of components and products with significant energy savings and increased payloads. Scale-up research across multiple areas to accelerate market expansion by applying an integrated materials and manufacturing approach, addressing a lack of design guides and certifications as well as affordability and scale-up challenges. The goal is to catalyze the development of an advanced lightweight metal U.S. supplier base and to enable DoD to realize greater speed and agility of manned, unmanned, and Warfighter systems as well as benefits for commercial applications.<br>***FY 2020 Plans:***<br>Continue ongoing efforts with a focus on (1) completion of the lightweight armor development effort, along with initiation of transition to Army vehicle protection system, (2) development of ICME models for cold spray, which will enable more efficient qualification/certification of cold spray for Navy and Army repair applications, (3)development and implementation of next generation joining technology to decrease distortion and cost during ship construction, (4) development of agile forming techniques suitable for part production in forward deployed locations, and (5) expansion of education and workforce programs will continue along with growth of the Learning Lab activities.<br>***FY 2021 Plans:***<br>Plans include the funding of projects to support DOD and the commercial industrial base to benefit the warfighter, to expand Smart Manufacturing Capabilities, and to develop and advance Hypersonic capabilities and other DoD modernization priorities, and continuing to develop education and workforce programs that will benefit the DoD and defense industrial base workforce. Accelerate deployment of advanced manufacturing technologies such as linear friction welding; design and manufacturing methods for promising high strength alloys; optimized ultra-fast heat treatment and quenching techniques for thin-walled casting applied to components for military vehicles.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:*** | | | |

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| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Level of effort is consistent between FY 2020 and FY 2021. Small changes reflect budget fluctuation. | | | |
| ***Title:*** American Institute for Manufacturing | 23.000 | 4.954 | 4.280 |

***Description:*** Integrated Photonics (Device Manufacturing and Packaging)
Description: Integrated photonics manufacturing advances the promise of unprecedented interconnection between electronics and photonics that will deliver previously unattainable performance in speed, density and power consumption, quickly providing differentiating benefits for defense applications such as high-speed signal processing, electronic warfare, position, navigation, and timing, information transport and computation, sensing, imaging and targeting. This institute is establishing an end-to-end 'ecosystem' in the U.S. for advancing domestic integrated photonics manufacturing. This institute has developed access to a responsive integrated photonics fabrication foundry, including the world's only 300 mm silicon photonics multi-project wafer service, photonics-electronics integrated design tools, and a highly advanced packaging, assembly and testing user facility.

***FY 2020 Plans:***
Complete technical performance of all projects awarded in FY 2018 and make results available in the knowledge management system to the membership, including DoD stakeholders. Continue bringing together uniquely qualified teams to accelerate technical responses to major sustainment challenges like the Maturation of Additive Manufacturing for Low-Cost Sustainment (MAMLS) program. Continue leading impactful international initiatives to define and document industry additive manufacturing standards, by facilitating the Additive Manufacturing Standards Collaborative (AMSC). Continue implementing new processes for transitioning technologies developed by the institute, strengthening the growing US-based additive manufacturing (AM) ecosystem. Continue education and workforce training initiatives with targeted Design for Additive Manufacturing (DfAM) workshops and train-the-trainer initiatives, and move toward industry recognized labor certifications and stackable credentials. Award and begin execution of industry-led and jointly-developed technical projects addressing affordability of additive manufacturing. Continue to host events across the U.S. to convene industry, academia, and public partners in AM on AM topics that will accelerate the deployment of AM to defense and commercial users. Continue to develop and align AM roadmaps from each of the Services and across the DoD with the support of the Joint Additive Manufacturing Working Group (JAMWG) and the Joint Additive Manufacturing Steering Group (JAMSG).

***FY 2021 Plans:***
Initiate a new long-term strategic partnership agreement between America Makes and the DoD to accelerate the adoption of Additive Manufacturing within industry and government, resulting in revamped staffing and increased stakeholder engagement, and enhance the coordination of AM investments across the Department with the support of the JAMWG and JAMSG. Continue to support efforts that accelerate the certification and qualification of additive manufactured parts. Leverage industry partnerships to accelerate the growth of the collaborative ecosystem by highlighting the strengths of the membership base. Organize and host attractive and timely events bringing AM leaders together on a regular basis to foster better AM collaboration. Enhance

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| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| the proven model of technical excellence through industry-led research projects by synthesizing those project outcomes and deliverables with industry trends and other outside information sources to continue to play a strategic leadership role in the Additive Manufacturing community at home and abroad.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Level of effort is consistent between FY 2020 and FY 2021. Small changes reflect budget fluctuation. | | | |
| ***Title:*** NextFlex Manufacturing Innovation Institute (Flexible Hybrid Electronics Manufacturing)<br><br>***Description:*** Flexible hybrid electronics manufacturing involves highly tailorable devices on non-traditional, compliant substrates that combine thinned components manufactured from traditional processes with components that are added via "printing" processes. This institute will invest in prototyping and scale-up of manufacturing processes for high speed pick-and-place, printed circuits, and hybrid fabrication that will enable defense and commercial applications in wearable electronics, unattended sensors and integrated array antennas, medical devices and soft robotics devices, and the continuous improvement in SWAPC (Size, Weight And Power plus Cost) for electronic systems.<br><br>***FY 2020 Plans:***<br>Accelerate the strategic engagement from DoD with a focus on prototyping products for DoD customers, increased utilization of the Pilot Line through an updated Process Design Kit, increased yields, design and integrated modeling tools, and funding for manufacturing R&D projects accelerating DoD adoption of FHE. Workforce development efforts will match the Learn and Earn participants with key EMS members to promote a qualified manufacturing industrial base.<br><br>***FY 2021 Plans:***<br>NextFlex will continue to mature flexible, stretchable hybrid electronics including advanced packaging and additive manufacturing technologies within their world class pilot manufacturing line. FY 2021 NextFlex goals include transition of at least two prototypes into defense systems in partnership with industry member teams and continue to deploy and transition its FlexFactor manufacturing education program.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Level of effort is consistent between FY 2020 and FY 2021. Small changes reflect budget fluctuation. | 6.500 | 4.954 | 4.280 |
| ***Title:*** Advanced Functional Fabrics of America (Smart Fibers and Textiles)<br><br>***Description:*** Accelerate the transformation of the manufacturing of traditional fibers, yarns and textiles into highly sophisticated, integrated and networked devices and systems and help convert the domestic textile industry into one that is differentiated by Intellectual Property (IP) and value-added technology. The outcome will lead to highly functional fabrics that provide valuable | 16.000 | 7.154 | 4.280 |

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|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603680D8Z / *Defense Wide Manufacturing Science and Technology Program* | **Project (Number/Name)**<br>350 / *Manufacturing Innovation Institutes* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| services: fabrics that see, hear, sense, communicate, store and convert energy, regulate temperature, monitor health, and change color while developing new and improved textiles to benefit the commercial consumer and warfighter.<br><br>***FY 2020 Plans:***<br>AFFOA plans to continue to pursue industry-sponsored projects, through the "Made in America" policy, to commercialize the technology. Extend the Micro-awards project strategy to continue to further the technology roadmap and engage more members. Continue to solicit agency-directed project through the Defense Fabric Discovery Centers. Refine Education Workforce Development activities to ensure sufficient pipeline expertise and recruitment and assist in future technology transition/ commercialization opportunities.<br><br>***FY 2021 Plans:***<br>AFFOA plans to scale LED and energy fibers, at low-rate production lengths, and incorporate them into full garment/product prototypes for physiological, performance, stress/strain, etc. monitoring while working with DoD PEOs/Program Managers (Ex. PEO Soldier) to build insertion paths into programs of record. Additionally, there is a planned demonstration of secure communications in an Identification Friend or Foe (IFF) application for PM Soldier Clothing Individual Equipment.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The funding in FY 2020 completes the DoD funding commitment of $75.00-million to AFFOA and the FY 2021 funding provides initial funding for a new agreement to continue the public/private partnership with AFFOA. | | | |
| ***Title:*** BioFabUSA Manufacturing Innovation Institute (regenerative tissue manufacturing)<br><br>***Description:*** This institute is intended to advance state-of-the-art human tissue manufacturing innovations in cell and biomaterial processing, bioprinting, automation and non-destructive testing technologies. The goal is to establish a collaboration that will mature tissue-related technology across a range of manufacturing readiness levels (MRL) 4-7, enabling post-delivery assurance of tissue identity, viability, function, and efficacy. This Institute will bring together the diverse and currently fragmented collection of industry practices and institutional knowledge across many disciplines (cell biology, bioengineering, materials science, analytical chemistry, robotics, and quality assurance). Technical focus at a minimum will be comprised of five thrust areas: (1) Cell Selection, Culture and Scale-up, (2) Biomaterial Selection and Scale-up; (3) Tissue Process Automation and Monitoring; (4) Tissue Maturing Technologies and (5) Tissue Preservation and Transport.<br><br>***FY 2020 Plans:***<br>Continue to expand the membership and refine core investment areas and demonstrate the self-sustainment of the innovation ecosystem. Full functional capability of the Tissue Foundry established as the core platform for manufacturing workforce development and to align manufacturing R&D efforts and validate new measurement technologies. Full functional capability of the | 19.159 | 17.154 | 10.688 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603680D8Z / *Defense Wide Manufacturing Science and Technology Program* | **Project (Number/Name)**<br>350 / *Manufacturing Innovation Institutes* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| BioFabUSA Incubator with unique opportunities for regenerative medicine companies that can expedite time to commercialization at scale.<br><br>***FY 2021 Plans:***<br>In FY 2021 BioFabUSA will continue to improve the tissue foundry prototype line. As BiofabUSA develops supported tools and enabling technologies through institute projects, they will begin to replace off-the-shelf tools used to develop the initial prototype line.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The funding decrease is based on the funding profile for the BioFabUSA agreement that provides $80.000 million to the agreement through the current period of performance. | | | |
| ***Title:*** Advanced Robotics Manufacturing (Smart Collaborative Robotics for Manufacturing)<br><br>***Description:*** Improve U.S. competitiveness in manufacturing through advancements in the smart collaborative robotic field. The technologies developed in this institute will be primarily focused in making advanced manufacturing more competitive, addressing DoD needs, and contribute to improving prosperity in the United States. The Institute will focus on technology areas such as human robot interaction, adaption, learning, manipulation, autonomy, mobility and perception.<br><br>***FY 2020 Plans:***<br>Accelerate research, development, and implementation of collaborative robotic technologies for use in manufacturing. Early use include smart companion robots for vehicle assembly, perception-aided collaborative robotic wire harness assembly, robot assistance for composites manufacturing, and robotic sanding and finishing. The focus is on (1) Versatility — robots that can perform a variety of tasks; (2) Flexibility — robots that can be deployed and re-deployed rapidly and easily; (3) Lower cost — reducing the overall cost of robot systems; and (4) Collaboration — robots that safely work alongside and with people.<br><br>***FY 2021 Plans:***<br>ARM will continue to accelerate technology in these areas: (1) Risk Reduction for Transition to the Factory Floor (methods and tools for adoption, integration, and readiness to include virtual modeling and simulation and testing); (2) Human-Robot Interaction (user-friendly interfaces; natural language communication; human-robot trust/safety); (3) Interoperability (Plug-and-play hardware/ software; open source/open architectures); (4) Reconfigurable, Agile, and Flexible Robotic Systems (modular designs; smart, flexible end-effectors; smart, flexible sensors; automated path planning/mobility); and, (5) Intelligent Robotic Systems (collaborative; self-aware; Machine Learning/Artificial Intelligence techniques; advanced computing).<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:*** | 19.000 | 17.155 | 10.609 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603680D8Z / *Defense Wide Manufacturing Science and Technology Program* | **Project (Number/Name)**<br>350 / *Manufacturing Innovation Institutes* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| The funding decrease is based on the funding profile for the Advanced Robotics Manufacturing agreement that provides $80.000 million to the agreement through the current period of performance. | | | |
| ***Title:*** Synthetic Biology (SynBio) Manufacturing Innovation Institute<br><br>***Description:*** Synthetic biology (SynBio) promises to deliver a new class of manufacturing to provide the United States with domestic capabilities to manufacture critical resources with increased supply chain security. SynBio manufacturing also has the potential to create entirely new classes of products with primary defense applications, such as chemicals and materials with advanced properties for use in austere environments. SynBio manufacturing addresses defense priorities and offers commercial potential for innovations in food, agriculture, fuel, pharmaceuticals, and other consumer products that will create new opportunities for U.S. manufacturers.<br><br>***FY 2021 Plans:***<br>Establish SynBio manufacturing innovation institute (MII) to foster an end-to-end U.S. 'ecosystem' for synthetic biology including cohesive scale-up manufacturing and downstream processing capabilities, integrated test & evaluation capacity, and data operationalized for design for manufacturing, all coupled with workforce development and a focus on ethics and biosecurity. The MII will be structured to address DoD and commercial applications.<br><br>DoD will partner with the MII leadership to refine the strategic investment plan, establish initial membership in the SynBio ecosystem, initiate a SynBio technology road mapping process for all technical focus areas, and launch projects. The MII will take steps to bring together government, industry and academia SynBio capabilities to better position the U.S. relative to global competition. The SynBio MII will also enable universities and small to medium enterprises to participate in and benefit from the MII's manufacturing advances.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding provided in FY 2021 to stand-up new SynBio Manufacturing Innovation Institute. | - | - | 15.000 |
| **Accomplishments/Planned Programs Subtotals** | 91.909 | 66.235 | 61.977 |

| | FY 2019 | FY 2020 |
|---|---|---|
| ***Congressional Add:*** Manufacturing Engineering Programs | 5.000 | 5.000 |
| ***FY 2019 Accomplishments:*** This program increase entitled "Manufacturing Engineering Programs" supports Department efforts to engage in manufacturing related efforts to assist in maintaining a technically trained workforce to meet the defense industrial base requirements of the Department of Defense. Competitive grants | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603680D8Z / *Defense Wide Manufacturing Science and Technology Program* | **Project (Number/Name)**<br>350 / *Manufacturing Innovation Institutes* |

| | FY 2019 | FY 2020 |
|---|---|---|
| and awards are planned that will engage community colleges, technical schools and the DoD institutes to accomplish this effort.<br><br>***FY 2020 Plans:*** Support competitive grants and awards with community colleges, technical schools and the DoD institutes that support education and workforce development activities. | | |
| ***Congressional Add:*** Manufacturing Institutes<br><br>***FY 2019 Accomplishments:*** This program increase will be used to support activities at the Digital Manufacturing and Design Innovation Institute in the following areas: (1) digital design, product development and systems engineering; (2) the digital factory of the future; (3) creating agile, resilient supply chains; and (4) cybersecurity for manufacturing.<br><br>***FY 2020 Plans:*** 1. Manufacturing Innovation Institutes ($10M) - Continue technology development, technology transition, and support education/workforce development in manufacturing innovation institutes supporting DoD modernization priorities.<br><br>2. Advanced Manufacturing ($10.000 million): Identify and invest in advanced manufacturing technologies that are high priority to the DoD.<br><br>3. Manufacturing Cybersecurity ($14.000 million): Support and collaborate with other Federal agencies on cybersecurity for manufacturing. Focus will be on small and medium sized businesses and in support of the cybersecurity maturity model certification activities.<br><br>4. Silicon Based Lasers ($25.000 million): Mature the manufacturing processes for high volume integrated silicon-based lasers on a 300mm semiconductor foundry process line for use in critical national security applications. | 7.512 | 59.000 |
| ***Congressional Add:*** Advanced Manufacturing<br><br>***FY 2019 Accomplishments:*** Coordinating with Service Matter Experts (SMEs) in Cold Spray Technology to expand usage of Cold Spray technology to DoD organic repair and maintenance facilities, develop part families for land, air, and sea applications, and expand the Cold Spray supply chain to meet additional DoD applications. | 30.000 | - |
| ***Congressional Add:*** Program Increase | - | 20.000 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603680D8Z / *Defense Wide Manufacturing Science and Technology Program* | **Project (Number/Name)**<br>350 / *Manufacturing Innovation Institutes* |

| | FY 2019 | FY 2020 |
|---|---|---|
| ***FY 2020 Plans:*** Support DoD modernization priorities manufacturing challenges and gaps. Accelerate ongoing efforts to provide earlier transition of technologies to the warfighter. Maintain DoD's strategic relationships with the established eight manufacturing innovation institutes and support associated supply chains. | | |
| ***Congressional Add:*** HPC enabled advanced manufacturing<br>***FY 2020 Plans:*** Work with The U.S. Army Engineer Research and Development Center's (ERDC), the Oak Ridge National Labs, and the University of Maine's Advanced Structures and Composites Center to productionize large scale 3-D manufacturing process utilizing biobased feedstocks to fabricate prototypes and manufactures shelters, vehicles and other large systems for the Army and other military customers. | - | 17.000 |
| **Congressional Adds Subtotals** | 42.512 | 101.000 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Each Manufacturing USA institute is established through a competitive selection process. The executing military department or agency, in close and continuous coordination with OSD ManTech, publishes a formal solicitation (funding opportunity announcement) for proposals describing the scope of required activities and extensive proposal evaluation criteria. Non-Profit Organizations (including universities) are eligible to bid, and each bidder forms a broad consortium of industry and academic partners. The executing military department or agency, in close coordination with OSD, uses a team of government experts to evaluate each proposal against the evaluation criteria and selects a winning consortium. The final terms of the cooperative agreement/technology investment agreement between the selectee and the federal government are then negotiated and the CA or TIA is signed. Throughout and after completion of this process, the federal government makes clear that members of non-selected teams are encouraged to join the selected consortium as conditions permit.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 3 | R-1 Program Element (Number/Name)<br>PE 0603680D8Z / *Defense Wide Manufacturing Science and Technology Program* | Project (Number/Name)<br>607 / *National Security Technology Accelerator Program* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 607: *National Security Technology Accelerator Program* | - | 15.000 | 0.000 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

**Note**

Previous Years funding was provided as a congressional add transferred from Defense Logistics Agency's Generic Logistics R&D Technology Demonstrations Program, PE 0603712S.

**A. Mission Description and Budget Item Justification**

The MD5 National Security Technology Accelerator (MD5) is a program office within the Office of the Undersecretary of Defense for Research and Engineering (OUSD(R&E)) that seeks to develop deep partnerships between the Department of Defense (DoD) and non-traditional thought partners, including colleges and universities, the entrepreneurial community and disruptive innovators within DoD itself. The speed and reactivity of the modern technology-threat environment challenge the traditional top-down model of defense problem-solving and capability development. Mitigating this deficiency requires developing internal workforce and organizational competencies and associated resources related to problem framing, knowledge and resource sharing, and non-traditional partnerships. Consistent with guidance from the Secretary of Defense and new Defense Innovation Initiative (DII), MD5 is a portfolio of innovation programs that (1) accelerates capability development leveraging non-traditional collaborators and “bottom-up” approaches, (2) augments the defense industry through the creation of startup businesses, and (3) enhances the DOD workforce through critical innovation skills development.

This program seeks to maintain the long-term competitive advantage for the US military over adversaries by tapping into high-potential uniformed and civilian employees of the DoD (i.e. intrapreneurs) and increasing their interactions with high-speed innovators and entrepreneurs outside of the DoD. This is accomplished by providing training and tools to these DoD intrapreneurs that empower them to find new ways to identify, frame, and solve problems as well as opening avenues to broadly implement the solutions they create. Additionally, the programs executed create opportunities for external innovators and entrepreneurs to be exposed to DoD problems and allow them to demonstrate possible solutions they can bring to bear on problems.

MD5/NSTA carries out its mission via three portfolios of effort: Education, Collaboration, and Acceleration. MD5 education and training programs develop DOD and industry personnel educated to continuously test and improve legacy processes and systems. MD5 collaboration programs like crowdsourcing develop human-centered networks that address DOD capability needs in an agile, cost-effective manner. MD5 acceleration programs develop ventures inside and outside of DOD that develop, commercialize, or apply technology relevant to warfighter problem sets.

MD5 is a Congressional interest program that has received funding in FY 2016 ($5M), FY 2017 ($25M), FY 2018 ($25.5M), and FY 2019 ($15M).

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** National Security Technology Accelerator Program | 0.000 | - | - |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603680D8Z / *Defense Wide Manufacturing Science and Technology Program* | **Project (Number/Name)**<br>607 / *National Security Technology Accelerator Program* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|

***Description:*** The MD5 mission is to develop "bottom-up" innovation as a core Department of Defense (DoD) competence that complements the traditional defense industrial base and Research, Development, Technology and Engineering (RDT&E) enterprise.

Education Portfolio
The Education Portfolio programs contribute to workforce development by cultivating innovators and entrepreneurs inside DoD who are adept at creative problem solving, the development of innovative approaches and technologies, and venture formation that will improve national security, as well as deliver economic and social value.
• "Boot Camps" are 4-day short courses that provide military organizations the opportunity to address some of their most pressing challenges in new ways. In the course, participants are instructed on topics related to innovation and intrapreneurship (including human centered design, lean methodology, technology literacy, and psychology of innovation) and taught to apply these skills to a set of command-sponsored problem topics. By the end, participants will have developed initial concepts to address these problem topics.
• "Startup Innovation Fellowship (SIF)" is a 6-week fellowship opportunity for service members and civilians to be embedded in private companies to learn best practices in critical areas such as data science, artificial intelligence and machine learning, cyber security, logistics, rapid prototyping, etc. that can be brought back into the DoD.

Collaboration Portfolio
The Collaboration Portfolio programs connect communities of innovators around problems and technologies relevant to national security to enable formation of new ventures.
• "Hacks" exposes college students and local ventures to DoD customer problems over a 48 hour period and aims to provide MVP or low-TRL solutions through one of two channels: formation of a venture and/or direct solution adoption by the problem sponsor.
• "Hacking for Defense (H4D)" exposes college students to DoD customer problems over an academic semester and aims to provide MVP solutions through one of three channels: formation of a venture; direct solution adoption by the problem sponsor; or reframing the original problem.
• "Source" invites bottom-up, 'deckplate' innovation from inside a military formation by providing either new solutions and novel applications directly to leadership from a sponsoring command.
• "Catalyst" exposes local ventures to DoD customer problems over a 6-18month period and aims to provide high-TRL solutions for immediate adoption by the problem sponsor or a DoD contracting entity (e.g., DIUx).

Acceleration Portfolio

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603680D8Z / *Defense Wide Manufacturing Science and Technology Program* | **Project (Number/Name)**<br>607 / *National Security Technology Accelerator Program* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| The Acceleration Portfolio programs grow and mature civil-military technology ventures by ensuring that innovators can access critical resources, including design and engineering support, mentorship services, and commercial and DoD research and development infrastructure to build, test, and enhance venture concepts.<br>• “Maker” provides facilities, access, materials, and training to entrepreneurs to fabricate, develop, and facilitate rapid prototyping of their technology. These more refined prototypes can further help DoD in deciding whether to commit more resources to a product. Primary capability located at Eagle Maker Hub at USM and Lincoln Lab at MIT. Also planning pilot with Idea Forge at CU Boulder.<br>• “Fed Tech” pairs cutting edge inventor teams and technologies from the United States federal government laboratory system with highly qualified entrepreneurs to conduct customer discovery and build business models. The program leverages lean startup techniques, while also focusing on the unique aspects of turning a federally funded technology into a startup company. The program is split into two phases: Phase 1 – Startup Studio focuses on technology selection and team formation; Phase 2 – Pre-Accelerator is a deeper dive with the best teams from Phase 1 to focus on building a company around the technology.<br>• “MD5 Starts” is a format for showcasing early stage startups who are working on technologies and products that are pursuing a dual-use market strategy. MD5 acts as a facilitator and convener amongst the ecosystem actors in a local geography, from incubator and accelerator programs, to research universities, startups and local or regional economic development organizations. The goal of the event is to showcase the great economic opportunity that exists in building companies that have both great market potential and which address important and urgent needs of national security and defense.<br>• “Hatch” helps entrepreneurs/teams with an idea (i.e., from H4D) learn how to form and build a venture using industry best practices. The initial pilot is with the Founder Institute incubator program where MD5 candidates will participate.<br>• “Propel” provides companies that have prototypes or initial customers with world-class education, mentorship, and relevant business connections to prepare the venture for scale while elevating their visibility in the venture community. The initial pilots of this program are with TechStars and MassChallenge. This program envisions feeding from Hacks and H4D.<br>• “Gauge” provides facilities, access, materials, and training to entrepreneurs to develop, iterate, and refine their technology up to TRL 6/7. Also provide access to test and development ranges.<br>• “Launch” identifies existing government technology that can be applied to a stated customer problem or problem set and to then work with a team on a path to commercialize that technology.<br>• “Boost” provides opportunities for companies to secure early, non-dilutive government funding in the form of grants or contracts. This program will rely on the use of Small Business Innovation Research grants/contracts.<br>• “Bridge” provides founding teams with mentors and advisors who can help them in business, customer, and product development by providing the right advice and insights at the right time.<br><br>Platform | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603680D8Z / *Defense Wide Manufacturing Science and Technology Program* | **Project (Number/Name)**<br>607 / *National Security Technology Accelerator Program* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| • "Defense Innovation Network" is the online platform (currently www.md5.net) that MD5 is developing to facilitate gathering ideas and building a network of DoD innovators both inside and outside of the DoD. This platform is used for both the Hacks and Source.<br><br>Accomplishments to-date:<br>1. Delivery of eight (8) Hacks; nine (9) Boot Camps; two (2) JPME Elective Courses; four (4) semesters of Hacking for Defense; five (5) technology demonstrations w/private and public capital.<br>2. One USMC Program of Record<br>3. Delivery of seven (7) prototypes; each in various states of Service-based testing and evaluation<br>4. Launch of nine (9) dual-use ventures with DoD contracts valued at more than $45M<br>5. More than 300 Service Members trained with bleeding edge, commercial innovation skill sets<br>6. Expansion of H4D into 12 top-tier, university partners<br>7. Expansion of MD5 into five (5) regional hubs throughout the United States (Denver; Los Angeles; Raleigh; NYC; and Boston)<br>8. Graduation of more than 30 venture innovation fellows with direct exposure to start-up culture, best practices and lean design<br>9. Transfer of 12 DoD lab technologies into commercial, early stage ventures for dual-use commercialization | | | |
| **Accomplishments/Planned Programs Subtotals** | 0.000 | - | - |

| | FY 2019 | FY 2020 |
|---|---|---|
| ***Congressional Add:*** National Security Technology Accelerator Program | 15.000 | - |
| ***FY 2019 Accomplishments:*** The FY 2019 Congressional Add supports continuation of activities initiated in FY 2018. | | |
| **Congressional Adds Subtotals** | 15.000 | - |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603699D8Z / *Emerging Capabilities Technology Development* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 378.125 | 59.350 | 109.411 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| 795: *Emerging Capabilities Technology Development* | 378.125 | 51.368 | 99.440 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| 717: *Red Teaming* | - | 7.982 | 9.971 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

**Note**

In FY 2021, all funding and project investment areas in the Emerging Capabilities Technology Development (ECTD) Program Element (PE) will transition to PE 0603338D8Z Defense Modernization and Prototyping (DM&P). The new PE will continue to leverage the year of execution processes that have allowed ECTD to rapidly and effectively develop and transition capabilities to respond to emergent issues, time-sensitive threats, and innovation opportunities. Through consolidation, the DM&P PE increases the Department's ability to coordinate activities across the Services and Defense Agencies, reduces duplication of effort, enables rapid pivots to new threats, and provides the resources necessary to ensure a technological overmatch against future threats. This realignment directly supports the Department's modernization plans by streamlining investments, reducing the time from discovery to deployment, and enabling development of disruptive technologies to help realize the National Defense Strategy.

Emerging Capabilities Technology Development funds rapid prototyping efforts and experimentation in collaboration with the Services, government labs, academia, allied partner nations, and industry to support the National Defense Strategy, Joint Staff, DoD modernization priorities, and Combatant Command (CCMD) needs. Completed ECTD projects transition to joint programs through fielded operationally relevant prototypes; technology adoption into programs of record; integration into system level, multi-year joint demonstrations; and through advanced research and engineering efforts like the Warfighting Lab Incentive Fund for further development of tactics, techniques, procedures, and concepts of operations. Previously selected ECTD projects have been accelerated to complete in FY 2020 or will transition to Program Element 0603338D8Z in FY 2021.

**A. Mission Description and Budget Item Justification**

In alignment with the National Defense Strategy, the Emerging Capabilities Technology Development (ECTD) Program Element (PE) supports the Under Secretary of Defense for Research and Engineering (USD(R&E)) with experimentation and mid-term, mission-focused capability development that crosses functional domains and enhances warfighter lethality, technical superiority, adaptability, and resilience. ECTD funding supports joint prototype development, joint experimentation for concept of operations (CONOPs) development, and red teaming validations that enable disruptive innovation to sustain the United States' operational superiority. Joint demonstrations and ECTD-sponsored venues of defense-wide experiments provide opportunities for emerging technologies to succeed, or fail fast. Demonstration venues include: Stiletto, a maritime experimentation and demonstration platform; Thunderstorm, a multi-domain venue focused on small and non-traditional businesses; Silent Hammer, an advanced electronic warfare venue; and, other tailored experimentation and demonstration events. The red teaming funding line explores vulnerabilities in emerging technologies and enables USD(R&E), and the broader defense science and technology community, to make informed decisions before investing in new capabilities. Red teaming enables adaptation to unforeseen vulnerabilities or opportunities early in capability development when design changes are cost effective and programs can be re-directed if developmental dead ends are discovered. ECTD prototypes, demonstrations, experimentations, and red teaming validations enable developers to showcase new and maturing capabilities in realistic environments and against realistic threats with operational user involvement.

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603699D8Z *I Emerging Capabilities Technology Development* |

ECTD prototyping projects increase the speed of technology innovation by reducing technology risk for emerging capabilities. With an emphasis on joint and interagency partnerships, ECTD matures capability options to anticipate and inform new acquisition pathways in addition to formal requirements and acquisition processes. Project selection is guided by Department-level strategies and priorities, such as the National Defense Strategy, the Chairman's Capability Gap Assessment, and Department of Defense (DoD) modernization priorities.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 60.700 | 80.911 | 75.284 | - | 75.284 |
| Current President's Budget | 59.350 | 109.411 | 0.000 | - | 0.000 |
| Total Adjustments | -1.350 | 28.500 | -75.284 | - | -75.284 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | -7.500 | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | -1.340 | - | | | |
| • Transfer to Defense Modernization and Prototyping | - | - | -75.284 | - | -75.284 |
| • Other Program Adjustments | -0.010 | - | - | - | - |
| • Congressional adds | - | 36.000 | - | - | - |

| Congressional Add Details ($ in Millions, and Includes General Reductions) | FY 2019 | FY 2020 |
|---|---|---|
| **Project:** 795: *Emerging Capabilities Technology Development* | | |
| Congressional Add: *Air Base Resilience Sensor* | 7.500 | 5.000 |
| Congressional Add: *High-Altitude Optical Reconnaissance Unit and Sensor (HORUS)* | 10.000 | 10.000 |
| Congressional Add: *Open Source Intelligence* | - | 3.000 |
| Congressional Add: *Remote Advise and Assist Technology Development* | - | 8.000 |
| Congressional Add: *Artificial Intelligence Enabled Sensor Network* | - | 10.000 |
| Congressional Add Subtotals for Project: 795 | 17.500 | 36.000 |
| Congressional Add Totals for all Projects | 17.500 | 36.000 |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603699D8Z *I Emerging Capabilities Technology Development* |

**Change Summary Explanation**

The FY 2020 Congressional adjustment of $28.500 million is the net of a $10.000 million increase for high-altitude optical reconnaissance unit and sensors, a $3.000 million increase for open source intelligence, a $8.000 million increase for remote advise and assist technology development, a $5.000 million increase for disruptive air and missile defense, a $10.000 million increase for artificial intelligence enabled sensor network, and a $7.500 million reduction for program growth.

The FY 2021 baseline reduction is the transfer out of the ECTD Program Element funding to the Defense Modernization and Prototyping PE (0603338D8Z) to provide alignment, transparency and focus supporting development of key technologies within USD(R&E) identified modernization prototypes and capability thrust areas.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 3 | R-1 Program Element (Number/Name)<br>PE 0603699D8Z / *Emerging Capabilities Technology Development* | Project (Number/Name)<br>795 / *Emerging Capabilities Technology Development* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 795: *Emerging Capabilities Technology Development* | 378.125 | 51.368 | 99.440 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

**Note**

In FY 2021, all resources in this project are transferred to the Defense Modernization and Prototyping Program Element (0603338D8Z) to support development of key technologies within USD(R&E) identified modernization prototypes and capability thrust areas.

**A. Mission Description and Budget Item Justification**

ECTD funding supports projects that reduce technology risk; create capabilities across functional domains; and, deliver increased lethality, resiliency, and adaptability through prototyping, demonstrations, experimentation, and red teaming. Individual projects typically cost less than $6.000 million and focus on rapid prototyping, experimentation, and demonstration of emerging technologies. ECTD funding also supports complementary demonstration venues that develop and mature emerging technologies.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Low Cost Innovative Projects (Projects less than one million dollars each) | 4.392 | - | - |
| ***Description:*** Emerging Capabilities Technology Development (ECTD) funds rapid prototyping projects requiring less than one million dollars for execution. ECTD selected, executed, and transitioned low cost projects in the areas of: electronic warfare; fully networked command, control and communications; microelectronics; artificial intelligence/machine learning; autonomy and other DoD Modernization Priorities or Joint Mission Capability areas. These projects delivered conceptual and proof-of-principle prototypes for evaluation or assessment by warfighters and other interagency users. In FY 2019, ECTD selected, executed, and transitioned multiple low cost projects, including:<br>• Cognitive Tools for Target Detection: This project leveraged machine learning, mixed reality, and heads-up-display technologies to demonstrate enhanced situational awareness for semi-autonomous to fully-autonomous vehicles with human supervisory control. This project successfully transitioned to the U.S. Army for further development.<br>• Additive Manufacturing for Low-Cost Unmanned Air Systems: This project demonstrated novel additive manufacturing processes to rapidly produce parts that are 3-dimensionally complex at low cost. This project successfully transitioned to the U.S. Air Force for further development.<br>• Air-Launched Effects: This conceptual prototyping project explored novel designs for a multi-mission small-unmanned aerial system that can be deployed from a variety of fixed-wing aircraft. This project successfully transitioned to the U.S. Air Force.<br>• Hydrodynamic Energy Efficiency: Numerical simulation and experimentation to explore various designs for energy efficiency though conceptual prototyping. This project successfully transitioned to the U.S. Navy. | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
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| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603699D8Z / *Emerging Capabilities Technology Development* | **Project (Number/Name)**<br>795 / *Emerging Capabilities Technology Development* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| • Advanced Thermoelectric Power Generator and Cooler: This project prototyped and tested multiple designs to identify low-cost, enhanced efficiency waste-heat recovering designs to generate power and on-board cooling of electronics and sensors. This project successfully transitioned to the U.S. Army, Navy, and Air Force for further development. | | | |
| ***Title:*** Distributed Collaborative Electronic Warfare & Radar (DISCOVER)<br>***Description:*** DISCOVER supports the National Defense Strategy's priority for increased lethality and the DoD's modernization priority for fully networked command and control. DISCOVER developed and demonstrated a fully networked, integrated, multi-function prototype to support multiple radio frequency (RF) concepts of operation (CONOPS) in a small form factor prototype. In FY 2019, DISCOVER completed algorithm development and hardware integration activities culminating in a series of field experiments to explore the DISCOVER prototype's capabilities and its impact on squad level operations. DISCOVER transitioned to the U.S. Marine Corps for continued CONOPS experimentation followed by further maturation by the U.S. Army. | 1.803 | - | - |
| ***Title:*** Joint Response Integrated and Collaborative (JRICO) Decision Support Tool<br>***Description:*** JRICO supports the National Defense Strategy's priority of delivering performance at speed while creating a more lethal force. JRICO demonstrates the use of artificial intelligence (AI) through autonomous machine learning (ML), a DoD modernization priority, to label and ingest data, exploit disparate and unstructured force management data, and create an interoperable and collaborative framework to improve time-critical decision making. JRICO improves both joint and Defense Support of Civil Authority operational planning through big data analytics to perform rapid analysis and seamless information sharing with increased speed and fidelity. In FY 2019, JRICO completed the data tagging strategy, developed Global Force Management services, finalized the application registry, and conducted a Military Utility Assessment at U.S. Indo-Pacific Command. Work continues in FY 2020 using FY 2019 funds to identify, implement, and mature AI/ML processes prior to executing the final demonstration. The JRICO capability transitions to the Joint Staff in FY 2020. | 0.950 | - | - |
| ***Title:*** Software-Defined Radar (SDRadar)<br>***Description:*** SDRadar leverages machine learning to help support the DoD modernization priority for missile defense. This project demonstrates a prototype cognitive software-defined radar to inform the development and demonstration of joint solutions for a resilient radar capability in congested and contested electromagnetic environments. The SDRadar prototype will demonstrate enhanced target detection and tracking in a variety of scenarios of interest to the U.S. Army and U.S. Air Force. The SDRadar prototype matured in FY 2019 with a focus on innovations to the hardware and software subsystems. Using FY 2019 funds, prototype integration and testing continues in FY 2020, culminating in an early FY 2020 demonstration prior to the prototype transitioning to the U.S. Army and U.S. Air Force. | 0.550 | - | - |
| ***Title:*** Situational Awareness Data Link (SADL) for Stand-Off Precision Guided Munitions (SOPGM) | 0.700 | - | - |

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| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603699D8Z / *Emerging Capabilities Technology Development* | **Project (Number/Name)**<br>795 / *Emerging Capabilities Technology Development* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Description:*** SADL-SOPGM directly supports the National Defense Strategy's priority for increased lethality and delivering performance at speed, by rapidly prototyping and integrating a miniaturized SADL radio into SOPGMs. The resulting prototype system enables enhanced surgical strikes against high value and irregular warfare targets in multiple environments, including urban, GPS-denied, and adverse weather. Integration of the data link radio into SOPGMs significantly enhances lethality, shortens kill-chains, and reduces collateral damage for the AC-130W/J gunship, Special Operations Forces (SOF) MQ-9 Reaper, and SOF MQ-1C Gray Eagle. In FY 2019, final integration of the SADL radio prototype into SOPGMs culminated in a series of live-fire test and evaluation events to characterize, assess, and validate system performance. The SADL SOPGM capability transitioned to U.S. Special Operations Command (USSOCOM) with an initial operational capability planned for FY 2020. | | | |
| ***Title:*** Polar Skywave Radar (PSR)<br><br>***Description:*** PSR directly supports the National Defense Strategy's priority for increased lethality through persistent long range sensors to address the limitations of the current North Warning Systems and emerging threats. PSR will mature and experiment with radio frequency (RF) hardware and advanced radar processing algorithms to validate that over-the-horizon skywave radar is viable for a future surveillance system in the polar region. PSR is focused on ten major tasks to extend skywave radar to the polar region including deployment of high frequency (HF) radar hardware for a scaled model and refinement of signal processing techniques. In FY 2019, PSR collected data and installed hardware to enable FY 2020 experimentation. In particular, PSR procured the transmitter shelter; designed and modeled a wide band antenna; collected data and analyzed it with newly developed physics-based modeling to provide a better understanding on the polar ionosphere; and devised an arctic HF communication experimental plan.<br><br>***FY 2020 Plans:***<br>FY 2020 tasks include continued data collection, radar signal processing refinement, HF communication experimentation, and evaluating predicted operational performance. Leveraging Missile Defense Agency (MDA) funding, PSR will culminate in a real-time demonstration with targets of opportunity before these technologies transition to the Air Force Life Cycle Management Center (LCMC).<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Polar Skywave Radar completed development in 2020. | 1.300 | 1.000 | - |
| ***Title:*** Advanced Tactical Power Generation (ATPG)<br><br>***Description:*** ATPG directly supports the National Defense Strategy's priority for increased lethality by prototyping a vehicle centric, mobile, fast forming, secure, and intelligent microgrid. The ATPG prototype provides ad hoc, resilient power for next generation EW, directed energy, and missile defense technologies and will enable: (1) on the move power generation to supply advanced protection system for maneuver forces; (2) improved logistics through reduced fuel consumption; and, (3) reduction | 2.291 | - | - |

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| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603699D8Z / *Emerging Capabilities Technology Development* | **Project (Number/Name)**<br>795 / *Emerging Capabilities Technology Development* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| in time required to setup, transport, and redeploy power generation systems. In FY 2019, the project completed subsystem component fabrication and testing. Using FY 2019 funds, on-vehicle integration activities continued in FY 2020 followed by integrated system testing. The initial prototype will transition to U.S. Army Product Manager Terminal High Attitude Area Defense for operational testing. | | | |
| ***Title:*** Printable Flexible Electronics with Nanomaterials Heterostructures (PFLEX)<br>***Description:*** PFLEX supports the National Defense Strategy's priority to deepen defense cooperation between the United States and partner nations. This project, conducted in partnership with India's Defense Research and Development Organization, prototyped a wearable microelectronic sensor system for environmental monitoring of potentially hazardous confined spaces. The PFLEX project demonstrated prototype units implementing a flexible electronic system architecture combined with oxygen and broad-band volatile organic compound sensors. In FY 2019, fabrication of the prototype advanced flexible sensor was completed and underwent testing and experimentation to characterize performance. The prototype units transitioned to the U.S. Air Force for testing and follow-on development activities. | 1.000 | - | - |
| ***Title:*** Rapid 3D (R3D) Data Generation<br>***Description:*** R3D directly supports the National Defense Strategy's priority for increased lethality through advanced simulations, synthetic training environments, and by providing superior knowledge of the battlespace during mission preparation and execution. R3D prototypes provide critical battlespace awareness to the warfighter, enabling rapid and accurate decision making at the tactical edge by closing the gap in terrain data for detailed tactical planning. R3D enables the interoperability required for short notice, joint mission rehearsal in addition to creating a common domain for rapid experimentation with future operational concepts.<br><br>In FY 2019, R3D continued to develop the architecture and groundwork for interoperability across SOF, conventional, and coalition forces. Activities included technical risk reduction and capability gap assessments for the Services, Combatant Commands, and the National Geospatial-Intelligence Agency (NGA). R3D also matured algorithms and the system architecture to deliver 3D terrain data on NIPR, SIPR, and JWICS. End user assessments, joint exercises, and iterative test and evaluation activities were incorporated to mature the system concept and design.<br><br>***FY 2020 Plans:***<br>In FY 2020, R3D will speed the generation of 3D data with AI/ML automation algorithms in a scalable cloud-hosted high performance computing environment. R3D will also demonstrate baseline capabilities on all three networks in support of a multi- | 2.000 | 1.000 | - |

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| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603699D8Z / *Emerging Capabilities Technology Development* | **Project (Number/Name)**<br>795 / *Emerging Capabilities Technology Development* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Service interoperability assessment and undergo final operational test and evaluation prior to transitioning to NGA, USSOCOM, and the Services to complete the joint architecture.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>R3D efforts will be completed at the end of FY 2020. | | | |
| ***Title:*** Project 18<br><br>***Description:*** Project 18 directly supports the National Defense Strategy's priority for increased lethality by demonstrating an organic counter unmanned aircraft system (UAS) capability for use by small units. This project integrated a novel non-kinetic capability to defeat adversary UAS onto existing operational platforms and experimented with the resulting prototype to inform concepts of operation (CONOPS). Additional details are classified. In FY 2019, the initial prototype completed fabrication and underwent testing and experimentation to characterize combat performance. The prototypes transitioned to USSOCOM for final evaluation and operational use. | 0.918 | - | - |
| ***Title:*** Multi-domain Experimentation and Demonstration Venues<br><br>***Description:*** Agile and flexible experimentation and demonstration capabilities and venues that support the National Defense Strategy's priority to increase the rate of innovation and enable Service, Combatant Command, and Agency user evaluation of emerging novel technologies in relevant environments. Demonstration venues include the Thunderstorm venue for small and non-traditional businesses; the Stiletto maritime technology platform; and, other tailored multi-domain venues and ad-hoc demonstrations. These experimentation and demonstration venues support the rapid discovery and transition of emerging technologies across the range of military operations. The venues provide the DoD and interagency partners with an opportunity to identify and evaluate new and emerging technologies both from commercial and government sectors through a series of technology demonstrations, experiments, vignettes, and related activities. The venues also offer a streamlined experimentation and demonstration process that encourages system developers to engage directly with the warfighter. These engagements enable rapid innovation and adoption of new technologies to meet operational needs through the exploration of military utility, and identification of potential risks of emerging technologies.<br><br>In FY 2019, Thunderstorm, Stiletto, and other venues conducted 22 demonstration and experimentation events, which featured 193 innovative technologies from focus areas including, multi-domain operations in Megacities, ubiquitous sensors, near-field communications systems, machine learning on unmanned aerial systems, and security for critical ports and harbors. Thirty-three of the technologies transitioned directly to DoD operational users or were leveraged by formal programs of record, including, persistent tethered unmanned autonomous vehicles (UAVs), augmented reality for small unit operations, and a sense-through-the-wall radar system. The demonstration and experimentation venues also provided 79 small businesses and non-traditional innovators with warfighter feedback critical to rapidly mature their technologies into viable prototypes. | 5.000 | 5.000 | - |

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| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***FY 2020 Plans:***<br>Building on previous experience, six to eight demonstrations to accelerate innovation are planned for FY 2020. These demonstrations will focus on cyber security using the synthetic environment, multi-domain operations in Megacities, and increasing small unit lethality. Capabilities evaluated will include near-field communication systems, cyber security for the warfighter, enhanced technologies for underwater operations, and other priorities identified through engagement with stakeholders.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>In FY 2021, the Multi-domain Experimentation and Demonstration Venues will transition to PE 0603338D8Z Defense Modernization and Prototyping to increase coordination and streamline transition of promising capabilities identified in demonstrations and field experiments. | | | |
| ***Title:*** Integration Support for Modernization of Joint Mission Capabilities<br>***Description:*** A conceptual prototyping effort to support engineering system design and integration of novel technologies into critical Joint Mission Capabilities. Conceptual prototypes address DoD modernization areas by leveraging industrial base investments and rapid transition pathways to Service end users. In FY 2019, about thirty individual concepts were explored across electronic warfare, integrated fire control, and rapid targeting and defeat of threats. Each conceptual prototype fused expertise and constraints from multiple Services, traditional and non-traditional industry, and research and development centers. Successful prototypes will be selected for rapid maturation through future development efforts leading to deployed Joint Mission Capabilities. Depending on scale, application, and maturity future efforts may be funded from the ECTD Conceptual Prototyping to support DoD Modernization Priorities project, PE 0603648D8Z Joint Capability Technology Demonstration (JCTD), or PE 0604331D8Z Rapid Prototyping Program. Further details are classified. | 12.964 | - | - |
| ***Title:*** Silent Hammer (SH)<br>***Description:*** SH is a multi-year, multi-agency, series of field experimentation activities. SH explores and demonstrates new electronic warfare (EW) and cyber technologies and approaches through the use of large-scale, dynamic field experiments. SH includes scripted and dynamic scenarios to experiment with the efficacy of both existing and new capabilities to engage emerging electromagnetic spectrum threats. The EW Community of Interest, Executive Committees, and warfighters are involved in the selection of follow-on experimentation topics, technology demonstrations, and scoping of these efforts to ensure their maximum relevance and value. In FY 2019, Silent Hammer completed the initial SH 1 field experiment.<br>***FY 2020 Plans:*** | - | 5.000 | - |

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| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603699D8Z / *Emerging Capabilities Technology Development* | **Project (Number/Name)**<br>795 / *Emerging Capabilities Technology Development* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Building on the success of SH 1, FY 2020 activities focus on planning and preparation for SH 2, which is planned for early FY 2021.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>In FY 2021, the Silent Hammer Demonstration Program will transition to PE 0603338D8Z Defense Modernization and Prototyping to increase coordination and streamline transition of promising capabilities identified in SH field experiments. | | | |
| ***Title:*** Conceptual Prototyping to Support DoD Modernization Priorities<br><br>***Description:*** This effort prototypes cutting-edge land, sea, undersea, air, and space capabilities critical to the National Defense Strategy and DoD modernization priorities. This effort matures and experiments with key component technologies and representative prototypes of fully networked command, control, and communications; space; autonomy; hypersonics; microelectronics; cyber; quantum science; directed energy; and, machine learning systems to accelerate development and adoption of cost effective and interoperable solutions for defense challenges. Selected limited-duration projects design, mature, and deliver conceptual prototypes to reduce the time from idea to demonstrated capability; mitigate risk in DoD programs; and, help characterize potential CONOPS. Conceptual prototyping activities seek to rapidly develop and demonstrate capabilities that can help maintain U.S. technological edge. These prototypes will be delivered to joint Service users to evaluate operational capabilities and inform requirements and technical feasibility of future acquisition programs. Potential venues for prototype assessment include the Stiletto Maritime Demonstration Program, Thunderstorm integration exercises, and multi-domain demonstration venues across the DoD. Demonstration of advanced prototypes will involve partnerships with the Services, industry, academia, interagency, international, and non-traditional DoD partners.<br><br>***FY 2020 Plans:***<br>This focus area will mature concepts and designs through conceptual prototyping that result in interoperable solutions. While project determinations are generally made in the year of execution, projects considered will address challenges within the DoD modernization priorities. Potential areas to investigate through conceptual prototyping include quantum sensing and processing; machine learning to gain a competitive military advantage; novel microelectronics and microelectromechanical systems; distributed logistics in contested environments; dismounted electromagnetic spectrum technologies for communications and distributed electronic warfare; implementation of directed energy on small, low-cost autonomous platforms; and, component technologies with the potential to enable disruptive space capabilities. FY 2020 projects will focus on efforts that complement, fill gaps, or align with the FY 2021 capability thrust areas identified in PE 0603338D8Z Defense Modernization and Prototyping.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>In FY 2021, these efforts will transition to PE 0603338D8Z Defense Modernization and Prototyping to increase coordination and streamline transition of promising capabilities. | - | 46.440 | - |
| ***Title:*** India Science and Technology (S&T) Partnerships Focus Area | - | 5.000 | - |

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| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Description:*** The India S&T Partnerships Focus Area is a Secretary of Defense directed program designed to deepen defense cooperation between the United States and India. By sharing research resources, capabilities, and expertise, the United States and India can jointly develop the technological innovations needed to enable our defense industrial bases to support our militaries now and in the future. Further, development of vibrant S&T cooperation is a key step in building an enduring partnership.<br><br>***FY 2020 Plans:***<br>In FY 2020, the India S&T Partnerships Focus Area and related funding will continue to develop and execute cooperative S&T projects. Additional cooperative S&T areas targeted include munitions development, advanced manufacturing, micro-power grids, energy harvesting capabilities, air-launched UAVs, virtual reality capabilities, and other identified project areas. Project selection is made during the year of execution in coordination with military representatives from India.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The funding for the India S&T Partnership Focus Area started in FY 2015 and concludes in FY 2020, with no additional funding currently allocated in FY 2021. | | | |
| **Accomplishments/Planned Programs Subtotals** | 33.868 | 63.440 | - |

| | FY 2019 | FY 2020 |
|---|---|---|
| ***Congressional Add:*** Air Base Resilience Sensor | 7.500 | 5.000 |
| ***FY 2019 Accomplishments:*** The Air Base Resilience Sensor project directly supports the National Defense Strategy's priority for increased lethality through rapidly prototyping and integrating an advanced sensor system concept to enhance detection and tracking of threat systems. Previous funding in FY 2016, FY 2017, and FY 2018 developed an advanced sensor chip assembly (SCA) and prototype test units incorporating the SCA to enable experimentation and validation of expected performance in a range of operationally relevant environments. In FY 2019, work continued to mature prototype test unit designs for several operational concepts. This technology area is a congressional interest item and additional resources were provided above the President's budget. Details of this project are classified.<br><br>***FY 2020 Plans:*** In FY 2020, activities continue to integrate and test the prototype units against targets in operationally relevant environments prior to a system demonstration anticipated to occur in FY 2021. | | |
| ***Congressional Add:*** High-Altitude Optical Reconnaissance Unit and Sensor (HORUS) | 10.000 | 10.000 |
| ***FY 2019 Accomplishments:*** HORUS designed, built, and evaluated a prototype capability for a high-altitude sensor system with military utility for the joint warfighter. HORUS matured an electro-optical prototype system to support pattern of life analysis at extreme distance that is adaptable to multiple manned or unmanned aircraft. | | |

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| | FY 2019 | FY 2020 |
|---|---|---|
| The HORUS prototype supports day or night operations by providing multi-spectral, high-definition full motion video from extreme slant ranges. In FY 2019, the sensor design was completed and fabrication of two prototype HORUS units continued. This technology area is a congressional interest item and additional resources were provided above the President's budget.<br>***FY 2020 Plans:*** Prototype fabrication will continue in FY 2020 followed by integrated system testing on an operationally representative platform. The prototype units will transition to USSOCOM for final evaluation and operational use. | | |
| ***Congressional Add:*** Open Source Intelligence<br>***FY 2020 Plans:*** This project directly supports the National Defense Strategy for increased lethality through targeted application of DoD Joint Mission Capabilities. The project leverages emerging tools and techniques to rapidly winnow down open source data to actionable intelligence. In FY 2020, the project will demonstrate a novel Open Source Intelligence capability to support DoD modernization areas. Specific demonstrations and activities will be finalized within the year of execution. This technology area is a congressional interest item and additional resources were provided above the President's budget. | - | 3.000 |
| ***Congressional Add:*** Remote Advise and Assist Technology Development<br>***FY 2020 Plans:*** This project directly supports critical decision and coordination processes enabling increased survivability for the joint warfighter and partners. The project showcases remote advise and assist technology that can be integrated with future Joint Mission Capabilities. In FY 2020, the project will develop and test remote advise and assist technology to support DoD processes. Specific demonstrations and activities will be finalized within the year of execution. This technology area is a congressional interest item and additional resources were provided above the President's budget. | - | 8.000 |
| ***Congressional Add:*** Artificial Intelligence Enabled Sensor Network<br>***FY 2020 Plans:*** This project directly supports the DoD Artificial Intelligence (AI) and Machine Learning (ML) modernization area. Though coordination with the, Joint Artificial Intelligence Center, this project will mature and demonstrate commercial tools and techniques for an AI enabled sensor network. In FY 2020, the project will demonstrate an AI enabled sensor network to inform future acquisition efforts. Specific demonstrations and activities will be finalized within the year of execution. This technology area is a congressional interest item and additional resources were provided above the President's budget. | - | 10.000 |
| **Congressional Adds Subtotals** | 17.500 | 36.000 |

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**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

ECTD leverages the Services' and Defense Agencies' most efficient and effective acquisition approach for rapid prototyping. This includes using Other Transaction Authorities and new or existing contract vehicles.

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| Appropriation/Budget Activity<br>0400 / 3 | R-1 Program Element (Number/Name)<br>PE 0603699D8Z / *Emerging Capabilities Technology Development* | Project (Number/Name)<br>717 / *Red Teaming* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 717: *Red Teaming* | - | 7.982 | 9.971 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

**Note**

In FY 2021, all resources in this project are transferred to the Defense Modernization and Prototyping Program Element (0603338D8Z) to support development of key technologies within USD(R&E) identified modernization prototypes and capability thrust areas.

**A. Mission Description and Budget Item Justification**

The Red Teaming project supports assessments and demonstrations to stress and assess emerging systems with the intent of gaining or maintaining overmatch earlier in the life cycle. The project helps assess the susceptibility and vulnerability of emerging technologies and newly developed systems, and helps identify unanticipated disruptive opportunities and technological dead ends. The project improves systems by reducing vulnerabilities and providing a holistic understanding of employment risks in operationally-representative environments and against potential threats prior to full funding commitments. The Red Teaming project supports three broad types of red teaming: 1) Early stage horizon scanning and assessments of weaknesses and opportunities of pre-development technologies from an adversary perspective; 2) Targeted, low-fidelity prototypes to assess utility and inform design choices prior to funding commitments; and 3) Red teams, war games, and field experiments with maturing technology to understand how to implement new technologies and adapt to adversary responses. This effort leverages the innovative capabilities of other defense red teaming organizations within the Department, Federally Funded Research and Development Centers (FFRDCs), government laboratories, and academia. Deliverables will inform requirements, new concepts of operations (CONOPS), and help accelerate technology acquisition pathways for joint missions.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Red Teaming to Support DoD Modernization Priorities | 7.982 | 9.971 | - |
| ***Description:*** Red Teaming to Support DoD Modernization Priorities funds efforts to explore new capabilities in a competitive environment. Efforts include: 1) Early investigations and red teaming to identify and understand potential vulnerabilities and opportunities from emerging and conceptual technologies. Projects will help define and anticipate impacts from new technologies, including current DoD investments and external technologies, to understand operational utility and identify threats from tangentially related sectors that can have significant negative impacts on current DoD investments. 2) Maturation of Service and Defense Agency identified prototypes to enable red teaming, demonstrations, experiments, and CONOPS earlier in the development cycle. These prototypes increase agility and rate of innovation for emerging capabilities, while reducing cost and risk. 3) Exploring unconventional approaches to counter current DoD and adversary technologies through red teams, war games, simulation exercises, and studies that employ government laboratory scientists; subject matter experts; and, students of science, technology, engineering, and math disciplines. Red teaming events range from distributed table-top games to simulated and live field exercises with non-traditional and operationally experienced participants. Deliverables include characterizations of future prototypes, requirement definitions, recommendations on system operational employment, potential vulnerabilities, and likely countermeasures that could be taken by the threat as well as potential counter-countermeasures to increase functionality or | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603699D8Z / *Emerging Capabilities Technology Development* | **Project (Number/Name)**<br>717 / *Red Teaming* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| operational effectiveness of the system. The USD(R&E) will leverage these products to inform how technologies and integrated systems can perform in hostile environments and develop new CONOPS.<br><br>In FY 2019, red teaming efforts were conducted to support the National Defense Strategy's priority for increased lethality and the Department of Defense's modernization priorities for cyber and artificial intelligence/machine learning. An early stage investigation was conducted to explore inherent vulnerabilities in a conceptual, pre-development technology prior to full funding commitments. A prototype was developed and assessed for utility by an associated red teaming event with operationally-experienced participants. Maturing technologies were red teamed to, either understand how best to implement and adapt the technology into CONOPS, or determine how best to counter adversary responses to the technology. Additional details are classified.<br><br>***FY 2020 Plans:***<br>Investment decisions for red teaming are made during the execution year in response to Department, Combatant Command, Service, and other government organization priorities and as new threats emerge or new opportunities are presented. In FY 2020, this project anticipants funding five to ten efforts to investigate red and blue impacts of technologies associated with DoD modernization priorities. Potential projects include assessments and demonstrations of electronic warfare capabilities and weaknesses; operations with high-bandwidth over-the-horizon networked communications; emerging near-peer counters in the areas of fully networked, smart devices; quantum sensors; and other potential counters to future U.S. technology investments. Project selection will be guided by the National Defense Strategy, and priorities and gaps identified by the Department, Combatant Commands, Services, other government organizations, FFRDCs, academia, and industry as new threats emerge or new opportunities are presented. FY 2020 projects will focus on efforts that complement, fill gaps, or align with the FY 2021 capability thrust areas identified in PE 0603338D8Z Defense Modernization and Prototyping.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>In FY 2021, these efforts will transition to PE 0603338D8Z Defense Modernization and Prototyping to increase coordination and streamline transition of promising capabilities. | | | |
| **Accomplishments/Planned Programs Subtotals** | 7.982 | 9.971 | - |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603716D8Z / *Strategic Environmental Research and Development Program (SERDP)* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 418.342 | 75.485 | 66.157 | 53.862 | - | 53.862 | 49.080 | 49.974 | 51.162 | 52.211 | Continuing | Continuing |
| 470: *Strategic Environmental Research and Development Program (SERDP)* | 418.342 | 75.485 | 66.157 | 53.862 | - | 53.862 | 49.080 | 49.974 | 51.162 | 52.211 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

SERDP`s mission is to improve DoD mission readiness and environmental performance by providing new scientific knowledge and developing cost-effective technologies. SERDP does this by addressing high-priority DoD environmental technology requirements such as addressing per- and polyfluoroalkyl substance (PFAS) contamination, developing fluorine-free fire suppression formulations, and improving corrosion resistance for weapons systems and platforms. Technologies developed by SERDP enhance military operations, improve military systems' effectiveness, enhance military training/readiness, sustain DoD ‘straining and test ranges and installation infrastructure, and help ensure the safety and welfare of military personnel and their dependents. The keys to growing list of SERDP technological successes are the ability to respond aggressively and proactively to priority defense environmental needs; the pursuit of world-class technical excellence; and an emphasis on continuous technology transfer.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 76.340 | 66.157 | 67.942 | - | 67.942 |
| Current President's Budget | 75.485 | 66.157 | 53.862 | - | 53.862 |
| Total Adjustments | -0.855 | 0.000 | -14.080 | - | -14.080 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | 0.941 | - | | | |
| • SBIR/STTR Transfer | -1.783 | - | | | |
| • Other Program Adjustments | - | - | -6.662 | - | -6.662 |
| • Cancelled Acct | -0.013 | - | - | - | - |
| • Economic Assumption | - | - | -0.064 | - | -0.064 |
| • Defense Wide Review Adjustment | - | - | -7.354 | - | -7.354 |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603716D8Z *I Strategic Environmental Research and Development Program (SERDP)* |

**Change Summary Explanation**

The decrease of $6.662 million is the result of planned program changes in OUSD(A&S). As a result of the Defense Wide Review, reduction of $7.354 million, the Strategic Environmental Research and Development Program (SERDP) office will work with the Services to scope the Return on Investment and potential overlap of efforts.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 3 | R-1 Program Element (Number/Name)<br>PE 0603716D8Z / *Strategic Environmental Research and Development Program (SERDP)* | Project (Number/Name)<br>470 / *Strategic Environmental Research and Development Program (SERDP)* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 470: *Strategic Environmental Research and Development Program (SERDP)* | 418.342 | 75.485 | 66.157 | 53.862 | - | 53.862 | 49.080 | 49.974 | 51.162 | 52.211 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

SERDP`s mission is to improve DoD mission readiness and environmental performance by providing new scientific knowledge and developing cost-effective technologies. SERDP does this by addressing high-priority DoD environmental technology requirements such as addressing per- and polyfluoroalkyl substance (PFAS) contamination, developing fluorine-free fire suppression formulations, and improving corrosion resistance for weapons systems and platforms. Technologies developed by SERDP enhance military operations, improve military systems' effectiveness, enhance military training/readiness, sustain DoD ‘straining and test ranges and installation infrastructure, and help ensure the safety and welfare of military personnel and their dependents. The keys to growing list of SERDP technological successes are the ability to respond aggressively and proactively to priority defense environmental needs; the pursuit of world-class technical excellence; and an emphasis on continuous technology transfer.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Environmental Restoration | 21.091 | 18.485 | 16.104 |
| ***Description:*** Investments in Environmental Restoration (ER) reduces DoD’s environmental cleanup liability ($33B) by developing technologies for the cost-effective detection, characterization, containment, and remediation of contamination in soil, sediments, and water. | | | |
| ***FY 2020 Plans:***<br>Continue the research into the detection, quantification, treatment, and bioavailability of PFAS (per- and polyfluoroalkyl substances). New projects will be initiated in "fingerprinting" for PFAS. | | | |
| ***FY 2021 Plans:***<br>Continue research on developing improved methodologies and technologies for managing PFAS contamination at DoD sites, further develop technologies to improve sustainability of munitions constituent use on testing and training ranges, and improve methodologies for managing contaminated groundwater. | | | |
| ***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Continue research on developing improved methodologies and technologies for managing PFAS contamination at DoD sites, further develop technologies to improve sustainability of munitions constituent use on testing and training ranges, and improve | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603716D8Z / *Strategic Environmental Research and Development Program (SERDP)* | **Project (Number/Name)**<br>470 / *Strategic Environmental Research and Development Program (SERDP)* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| methodologies for managing contaminated groundwater. The decrease of $2.381 million is the result of planned program changes in OUSD(A&S) and the result of the Defense Wide Review. | | | |
| ***Title:*** Munitions Response (MR)<br><br>***Description:*** Munitions Response (MR) develops detection, classification, and remediation technologies for Unexploded Ordnance (UXO) to address the significant DoD liability in the Military Munitions Response Program. Investments are also made to improve active range clearance and to reduce generation of UXO during live fire testing and training operations.<br><br>***FY 2020 Plans:***<br>Detailed analysis of previously-collected low-frequency acoustic data to maximize value in the detection and identification of unexploded ordnance underwater. Two new projects initiated on the mobility and burial of munitions in muddy sediments (as contrasted to the sandy bottoms previously investigated).<br><br>***FY 2021 Plans:***<br>Completion of engineering-level model of UXO burial, mobility, and re-exposure. Continued development of analysis algorithms for the detection and identification of unexploded ordnance at underwater ranges.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The decrease of $2.227 million is the result of planned program changes in OUSD(A&S) and the result of the Defense Wide Review. Reprioritization of funding to PFAS remediation (ER) and alternative formulations for AFFF (WP). | 11.101 | 9.729 | 7.502 |
| ***Title:*** Resource Conservation and Resiliency (RC)<br><br>***Description:*** Resource Conservation and Resiliency (RC) develops the science and technologies required to sustain training and testing ranges. This includes management strategies and tools to enable Installation staff to carry out their duties more effectively and development of data and models to enable base planners to increase resilience of their facilities.<br><br>***FY 2020 Plans:***<br>In depth examination of the interplay of fire and threatened and endangered species will be continued. New efforts on the definition of a sustainable installation will be initiated.<br><br>***FY 2021 Plans:***<br>Mature the fire science required for management of DoD test and training ranges. Develop planning tools aimed at resilient installations.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:*** | 22.201 | 19.458 | 15.505 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603716D8Z / *Strategic Environmental Research and Development Program (SERDP)* | **Project (Number/Name)**<br>470 / *Strategic Environmental Research and Development Program (SERDP)* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Long-term projects on the impacts of changing climate in regions important to DoD are concluding. The decrease of $3.953 million is the result of planned program change and the result of the Defense Wide Review. | | | |
| ***Title:*** Weapons Systems and Platforms (WP)<br><br>***Description:*** Weapons Systems and Platforms (WP) develops technologies and materials that reduce the waste and emissions associated with the manufacturing, maintenance, and use of DoD weapons systems and platforms to reduce future environmental liabilities and their associated costs and impacts.<br><br>***FY 2020 Plans:***<br>Initiation of a suite of projects on alternatives to Aqueous Fire Fighting Foam (AFFF) that do not contain fluorine. The current AFFF formulation is a major contributor to the PFAS contamination of DoD Installations.<br><br>***FY 2021 Plans:***<br>A supplemental solicitation for replacement AFFF formulations was released on August 1, 2019. We anticipate funding three to six new efforts from this solicitation.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The decrease of $3.734 million is the result of planned program changes in OUSD(A&S) and the result of the Defense Wide Review. | 21.092 | 18.485 | 14.751 |
| **Accomplishments/Planned Programs Subtotals** | 75.485 | 66.157 | 53.862 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603727D8Z / *Joint Warfighting Program (JWP)* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 43.713 | 5.161 | 4.846 | 3.871 | - | 3.871 | 3.994 | 4.082 | 4.156 | 4.252 | Continuing | Continuing |
| 727: *Joint Warfighting* | 43.713 | 5.161 | 4.846 | 3.871 | - | 3.871 | 3.994 | 4.082 | 4.156 | 4.252 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

The Joint Warfighting Program (JWP) supports the Assistant Secretary of Defense for Acquisition (ASD(A))'s responsibilities for acquisition and portfolio management. JWP underwrites analyses, studies, limited scope experiments, wargaming, and partnerships that define joint capability gaps and develops credible requirements for follow-on acquisition efforts. These analyses and assessments deliver independent perspectives on potential remedies to align acquisition investments and solutions for joint capability gaps created by future warfighting environments and emerging threats. JWP supports two main lines of effort, mission integration management and cyber resiliency wargames. Mission integration management will access specific critical mission threads, determine defense investments to fix lethality deficiencies, and to develop kill chain data modeling. Cyber resiliency wargames will be conducted in support of Combatant Commands mission areas to develop strategies for mitigation of cyber vulnerabilities focusing on ballistic missile defense, nuclear command and control and other key mission areas relevant to national security challenges.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 5.978 | 4.846 | 4.977 | - | 4.977 |
| Current President's Budget | 5.161 | 4.846 | 3.871 | - | 3.871 |
| Total Adjustments | -0.817 | 0.000 | -1.106 | - | -1.106 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | -0.598 | - | | | |
| • SBIR/STTR Transfer | -0.218 | - | | | |
| • A&S realignment to priority efforts for Industrial Policy/Special Programs/GSA | - | - | -0.872 | - | -0.872 |
| • Cancelled Acct | -0.001 | - | - | - | - |
| • Economic Assumption | - | - | -0.004 | - | -0.004 |
| • Defense Wide Review Adjustment | - | - | -0.230 | - | -0.230 |

**Change Summary Explanation**

Joint Warfighting Program decreased by $3.500 million across FY 2021-2025 due to realignment of mission areas and priorities to support enduring Agile Pilot requirements.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 3 | R-1 Program Element (Number/Name)<br>PE 0603727D8Z / *Joint Warfighting Program (JWP)* | Project (Number/Name)<br>727 / *Joint Warfighting* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 727: *Joint Warfighting* | 43.713 | 5.161 | 4.846 | 3.871 | - | 3.871 | 3.994 | 4.082 | 4.156 | 4.252 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

The Joint Warfighting Program (JWP) supports the Assistant Secretary of Defense for Acquisition (ASD(A))'s responsibilities for acquisition and portfolio management. JWP underwrites analyses, studies, limited scope experiments, wargaming, and partnerships that define joint capability gaps and develops credible requirements for follow-on acquisition efforts. These analyses and assessments deliver independent perspectives on potential remedies to align acquisition investments and solutions for joint capability gaps created by future warfighting environments and emerging threats. JWP supports two main lines of effort, mission integration management and cyber resiliency wargames. Mission integration management will access specific critical mission threads, determine defense investments to fix lethality deficiencies, and to develop kill chain data modeling. Cyber resiliency wargames will be conducted in support of Combatant Commands mission areas to develop strategies for mitigation of cyber vulnerabilities focusing on ballistic missile defense, nuclear command and control and other key mission areas relevant to national security challenges.

Anticipated Impact:
Provides analytical support for acquisition efforts for ASD(A) staff elements and joint customers. It promotes analyses and assessments for acquisition insights and decisions focused on capability development serving the needs of joint forces and the warfighter.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Acquisition Analysis for Joint Capability Requirements | 3.961 | 4.846 | 3.871 |
| ***Description:*** FY 2019 Accomplishments:<br><br>-F35 Sustainment Study. The study summarized the current F35 sustainment strategy, impediments to achieving the future state sustainment strategy with its corresponding readiness and affordability goals, and a plan of action to achieve goals.<br><br>-Mobile User Objective System (MUOS) Cyber Study. Narrow-Band Satellite Communications (SATCOM) and MUOS Enterprise Cyber Situational Awareness. Study leveraged best of breed technologies and best practice cyber situational awareness strategies for prevention and detection of cyber threat activity. Results intended to increase the cybersecurity posture of Internet Protocol based Military Satellite Communications systems.<br><br>-Open Architecture Space Systems. Analysis/study evaluated the feasibility and cost effectiveness to create open systems and software architectures for space situational awareness, management, and command and control of space systems. | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603727D8Z / *Joint Warfighting Program (JWP)* | **Project (Number/Name)**<br>727 / *Joint Warfighting* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| -Constellation Management for Proliferated Low-Earth-Orbit (PLEO) Missions. Analyzed the long term acquisition and sustainment implications of PLEO constellations, analyzed Command and Control (C2) concepts/architectures for acquisition trade-offs and long term sustainability, and assessed survivability approaches to PLEO constellations.<br><br>-Supply Chain Risk Mitigation. Analysis conducted for technical/engineering efforts to support software provenance and supply chain risk management to mitigate cybersecurity threats in Department of Defense (DoD) National Security systems and critical infrastructure from Information Technology (IT) products produced by potential adversaries.<br><br>- Agile Community of Practice. Study supported piloting the implementation of best practices for Agile software development. It contributed efforts to complete agile pilots and develop policy, procedures, and best practices to facilitate DoD adaptation of Agile Software Piloting methodology.<br><br>Anticipated Impact:<br>Provides analytical support for acquisition efforts for ASD(A) staff elements and joint customers. It promotes analyses and assessments for acquisition insights and decisions focused on capability development serving the needs of joint forces and the warfighter.<br><br>***FY 2020 Plans:***<br>Synchronize the Acquisition processes with corresponding acquisition requirement needs to enable acquisition portfolio management and mission thread analysis; define joint capability gaps and develop credible requirements for follow-on acquisition efforts; deliver independent perspectives on ways to align investments and potential solutions for capability gaps created by evolving threats not aligned to single Component missions; seize opportunities to partner with joint customers on projects that inform technology and acquisition decisions; and implement analytic projects on key joint warfighting mission areas and challenges. Invest in projects that support emerging Congressionally directed acquisition mission areas.<br><br>Specific Objectives:<br><br>-Cyber Resilience Wargames. FY 2016 NDAA Section 1647 directed the development of a strategy for the mitigation of cyber vulnerabilities. Cyber Resilience Wargames assess cyber risk at the Combatant Commands at the mission level as the basis for identifying and prioritizing mitigations.<br><br>-Mission Integration Management. FY 2017 NDAA Section 855 directed the establishment of a mission integrated management capability to assess specific critical mission threads and determine defense investments to fix broken effects/kill chains. This effort focuses on the management of mission threads to build more lethal forces. | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603727D8Z / *Joint Warfighting Program (JWP)* | **Project (Number/Name)**<br>727 / *Joint Warfighting* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| -Agile Pilot. FY 2018 NDAA Sections 873/874 direct piloting Agile Software acquisition methodology for warfighting and business systems to identify best practices and lessons learned to develop a new software acquisition pathway and policy. This effort is helping to drive the Department to a modern software acquisition practice thus reforming DoD's business practices for greater performance and affordability.<br><br>Anticipated Impact:<br>Provides analytical support for acquisition efforts for ASD(A) staff elements and joint customers. It promotes analyses and assessments for acquisition insights and decisions focused on capability development serving the needs of joint forces and the warfighter.<br>***FY 2021 Plans:***<br>Conduct acquisition analysis through a portfolio management lens to address the critical joint warfighting mission areas critical to national Defense. Major focus areas will support the following projects:<br><br>-Cyber wargaming on cyber security challenges, threats and resiliency of systems and infrastructure to identify gaps and remedies in support of USCENTCOM and USEUCOM. The methodology in the wargame will integrate systems engineering and cyber vulnerability analysis with modeling and simulation. It will include a detailed analysis and assessment of vulnerabilities in system architecture.<br><br>-Mission Engineering Effects/Kill Chain Development to build effects/kill chains as part of foundational framework for the Mission Engineering and Integration Approach.<br><br>-Mission Engineering Data Modeling in partnership with Cost Assessment and Program Evaluation (CAPE) and Joint Staff to pilot authoritative data modeling that is repeatable and scalable for capability portfolio management.<br><br>-Mission Engineering analysis to develop a methodology to transition from static architectures to executable dynamic models for time-dependent assessments of complex operations.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>ASD(A) adjusted funding and focus to address mission priority areas and realigned funding for enduring requirements for independent analyses in support of Agile software development and software provenance mission areas. In FY 2020 and beyond, this segment is combined with Acquisition Analytic Development of Joint Military Requirements. | | | |
| ***Title:*** Analytic Development of Joint Military Requirements | 1.200 | - | - |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
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| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603727D8Z / *Joint Warfighting Program (JWP)* | **Project (Number/Name)**<br>727 / *Joint Warfighting* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Description:*** This segment provides independent analysis of joint issues and capability gaps. It provides responsive and timely capability development pathways and recommendations for rapid acquisition through wargames and analyses conducted by joint military staffs and units. It provides an independent source for analysis and enables capability development suitable for joint experimentation undertaken by joint authorities.<br><br>FY 2019 Accomplishments:<br><br>-Cyber Resiliency Wargame. Conducted a joint wargame on cyber resiliency to identify gaps and remedies in support of USEUCOM's ballistic missile defense (BMD) mission area. Methodology integrated systems engineering, and cyber vulnerability analysis with modeling and simulation. Results included a classified detailed analysis and assessment of vulnerabilities in a system of system architecture. | | | |
| **Accomplishments/Planned Programs Subtotals** | 5.161 | 4.846 | 3.871 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603769D8Z / *Advanced Distributed Learning* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 21.437 | 13.414 | 22.446 | 6.765 | - | 6.765 | 6.478 | 5.699 | 5.699 | 5.947 | Continuing | Continuing |
| 776: *Advance Distributed Learning (ADL)* | 21.437 | 13.414 | 22.446 | 6.765 | - | 6.765 | 6.478 | 5.699 | 5.699 | 5.947 | Continuing | Continuing |

**Note**

Defense-Wide Reviews (DWR) - Funding for the Advanced Distributed Learning (ADL) Initiative was reduced by $9.7 million in FY 2021 resulting from the DWR, which focused on the Secretary's guidance to streamline operations, increase efficiency, and promote greater affordability within the OSD and Defense Agencies and Field Activities in order to ensure the Department's optimum alignment to the National Defense Strategy and DoD strategic guidance, with particular focus on building a more lethal, resilient, agile, and ready force while strengthening alliances, prioritizing cyber and space capabilities, and focusing on innovation to maintain the technological advantage. The FY2021 reduction is offset by an administrative zero-sum transfer ($3.0 million) from PE 0804767D8Z (i.e., Combatant Commander Exercise Engagement and Training Transformation [CE2T2] from The Joint Staff [TJS]).

**A. Mission Description and Budget Item Justification**

This Program Element (PE) describes the Advanced Distributed Learning (ADL) Initiative. This PE provides policy oversight and guidance for distributed learning (e.g., online courses, smartphone-based learning, web browser–based simulations) and supports associated modernization and coordination across DoD, coalition partners (e.g., NATO), and other federal agencies. This PE helps DoD and its partners maintain modern and interoperable digital learning systems for delivering training and education anytime and anywhere at scale. This program was originally established in 1997 in response to the NDAA (FY99, Section 378 of Public Law 105-261) and granted additional authorities via Executive Orders (e.g., EO 13111) and other supporting publications (e.g., 10 U.S. Code §2249d).

This PE's work falls into three interrelated categories: (1) Modernization, (2) Documentation, and (3) Coordination. The modernization work involves Advanced Technology Development in technical areas such as digital learning systems interoperability, learning analytics, and learning science for delivery at scale. These efforts inform the PE's documentation work, including the authoring and upkeep of technical guidance and policy documents such as DoD Instruction 1322.26 ("Distributed Learning") and software interoperability specifications. Finally, coordination efforts consist of implementation support and interagency/interorganizational coordination.

This PE's modernization investments are driven by requirements collected from the Defense ADL Advisory Committee, a working group that represents agencies' distributed learning equities (refer to DoDI 1322.26). These requirements are also aligned to DoD/federal strategic direction, such as the DoD Chief Management Officer's Digital Learning Modernization reform, Army Learning Strategy, Navy's Sailor 2025, and Air Force Strategic Master Plan.

This PE benefits DoD in three ways. (1) Interoperability: It strengthens interagency, interorganizational, and multinational interoperability by governing distributed learning interoperability policy, maintaining current technical reference guidelines, and fostering their implementation across communities of practice. (2) Efficiencies: It saves government resources by fostering unity of effort across DoD, other federal agencies, and coalition partners for distributed learning, eliminating duplications and identifying opportunities for interagency collaboration. (3) Learning Effectiveness: It helps improve training and education effectiveness by helping DoD, federal,

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
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| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603769D8Z / *Advanced Distributed Learning* |

and coalition stakeholders acquire and implement digital learning capabilities effectively and cost-efficiently. In sum, this work supports DoD Components' training and education missions, helping them increase personnel readiness while driving down training and education portfolio costs.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 13.564 | 13.723 | 13.493 | - | 13.493 |
| Current President's Budget | 13.414 | 22.446 | 6.765 | - | 6.765 |
| Total Adjustments | -0.150 | 8.723 | -6.728 | - | -6.728 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | -0.002 | - | | | |
| • SBIR/STTR Transfer | -0.148 | - | | | |
| • Congressional | - | 8.723 | - | - | - |
| • Economic Adjustments | - | - | -0.028 | - | -0.028 |
| • ADL Transfer from CE2T2 TJS | - | - | 3.000 | - | 3.000 |
| • Defense-Wide Review | - | - | -9.700 | - | -9.700 |

**Change Summary Explanation**

Funds reserved for special research programs, e.g., SBIR/STTR.

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Advance Distributed Learning (ADL) | 13.414 | 22.446 | 6.765 |

***Description:*** This PE serves as the innovation hub for distributed learning across the DoD and other government agencies. The ADL Initiative supports DoD-wide modernization in the domain of enterprise-wide network-based digital training and education. Activities include advanced technology design and development, demonstrations, assessments, and associated policy stewardship. Results improve the efficiency of DoD systems, increase their technical interoperability (which improves usability and reduces duplications of effort), and help DoD maintain up-to-date learning technologies that effectively support personnel readiness.

***FY 2020 Plans:***

1. Enterprise Course Catalog -- Consolidate distributed learning course listings to a single Defense-wide training and education course catalog, accessible through a single web-based portal. Demonstrate an initial operational capability in collaboration with

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
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| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| the Defense Acquisition University and Joint Knowledge Online. This work directly supports DoD Chief Management Office–directed reforms (“Digital Learning Modernization”).<br><br>2. Enterprise Learner Record -- Help inform and establish operational capabilities and policies for the security, privacy, and interoperability of Defense-wide learning and development records. Make progress toward an initial operational capability. This work directly supports DoD Chief Management Office–directed reforms (“Digital Learning Modernization”) and aligns with White House Interoperable Learner Record efforts.<br><br>3. Learning Services Ecosystem -- Continue to develop the technology infrastructure for the larger “learning ecosystem” (i.e., the Total Learning Architecture project); conduct pilot testing. This work indirectly supports DoD Chief Management Office reforms by providing the foundational data interoperability fabric for digital learning software systems.<br><br>4. Microlearning Mobile-Learning Platform -- Implement a Defense-wide micro-learning platform that allows taking advantage of "white space" for training/education (PERvasive Learning System [PERLS], see Issue Pape INV-11548). Conduct usability, verification, and validating testing.<br><br>5. Learning Technologies Warehouse -- Streamline acquisition of new distributed learning capabilities via cloud-hosted environment for transitioning new technologies; demonstrate initial operational capability.<br><br>6. Learning Data Semantic Interoperability -- Establish Defense-wide standards for the semantic interoperability of learner data (i.e., ensure data have shared meaning not only shared software formats). Demonstrate initial operational capability of the associated “profile server.”<br><br>7. NATO STANAG 2591 -- Inform and help update the NATO “Advanced Distributed Learning” policy to better facilitate resource sharing and modern distributed learning interoperability via coordination with the NATO Training Group Individual Training and Educational Developments working group.<br><br>8. Defense Learning-at-Scale Strategy -- Define an implementation roadmap for migrating distributed learning systems across DoD to meet enterprise-wide Digital Learning Modernization reforms that the DoD Chief Management Office directed.<br><br>9. Enhance Joint/Coalition exercises with ADL -- Demonstrate the efficient and effective use of (a) digital learning technologies and (b) learning analytics in large scale military exercises such as Aurora, Global Medic, and Bold Quest. | | | |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
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| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603769D8Z / *Advanced Distributed Learning* |

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| 10. Mitigating Flash Software End-of-Life -- Complete final year of this project, which was a response to the Adobe Flash software end-of-life. Help facilitate DoD's efficient transition of more than 10,000 Flash-based e-courses and set the foundations for learning technology modernization (e.g., metadata). This year's work primarily involves dissemination of best practices, coordination, and advice to DoD leadership.<br><br>11. Update Distributed Learning Policy and Guidance -- Continue to conduct research to inform Defense policy guidance on emerging distributed learning standards or implementation issues (e.g., learner data privacy). Continue to coordinate with the Defense ADL Advisory Committee to incorporate new requirements into existing Defense policy, such as new content metadata in support of the Enterprise Course Catalog.<br><br>12. Competency-Based Learning Enterprise Capability -- Continue to develop the learning methods and technology to enable interoperable, enterprise-wide competency-based learning; conduct testing with Air Force and Army stakeholders.<br><br>13. Federal Identity Management -- Identify and help implement the best practices for "Identity Management" (i.e., safely associating someone's personal identity with his/her system access and generated data) across different training and education technologies. Work involves implementing guidance from the Federal Government's Identity, Credential, and Access Management project (see M-19-17) as well as other industry best practices. Conduct testing with the Defense Counterintelligence and Security Agency.<br><br>14. Cultivating Learning Science to Improve Readiness -- Investigate the best practices for the design, delivery, and management of distributed learning at large scales including pedagogy, workforce, and governance. This work complements the technical work described above by defining the associated organizational processes needed to execute the technology effectively.<br><br>15. Defense Distributed Learning Requirements -- Conduct the next cycle of periodic stakeholder requirements collection to define existing gaps and future needs for Defense distributed learning. Produce an updated report.<br><br>16. Distributed Secure Live-Virtual and Constructive (LVC) Air Combat System Training Capability -- The $8.723 million increase in FY20 reflects a Congressional addition to further develop a Secure LVC Advanced Training Environment that will support air combat training for 4th and 5th generation platforms. | | | |
| ***FY 2021 Plans:***<br>1. Enterprise Course Catalog -- Consolidate distributed learning course listings to a single Defense-wide training and education course catalog, accessible through a single web-based portal. Facilitate transition to full operational capability in collaboration | | | |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
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| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603769D8Z / *Advanced Distributed Learning* |

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| with the Office of Personnel Management USALearning and other Defense stakeholders. This work directly supports DoD Chief Management Office–directed reforms (“Digital Learning Modernization”).<br><br>2. Enterprise Learner Record -- Continue work from FY20 to inform and establish operational capabilities and policies for the security, privacy, and interoperability of Defense-wide learning and development records. Demonstrate initial operational capability. This work directly supports DoD Chief Management Office–directed reforms (“Digital Learning Modernization”) and aligns with White House Interoperable Learner Record efforts.<br><br>3. Learning Services Ecosystem -- Continue to develop the technology infrastructure for the larger “learning ecosystem” (i.e., the Total Learning Architecture project); conduct pilot testing. This work indirectly supports DoD Chief Management Office reforms by providing the foundational data interoperability fabric for digital learning software systems.<br><br>4. Microlearning Mobile-Learning Platform -- Complete final large-scale testing and transition the fully operational capability for a Defense-wide microlearning platform that allows taking advantage of "white space" for training/education (PERvasive Learning System [PERLS], see Issue Paper INV-11548). Final R&D project year.<br><br>5. Enhance Joint/Coalition exercises with ADL -- Continue to incrementally enhance large-scale training exercises through (a) digital learning technologies and (b) learning analytics. Coordinate specific testing events with Joint Knowledge Online and Combatant Commands.<br><br>6. Update Distributed Learning Policy and Guidance -- Continue to coordinate with the Defense ADL Advisory Committee to incorporate new requirements into existing Defense policy, as required.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Decrease in FY2021 (-$9.7 million) reflects Defense-Wide Review reform initiatives. Reduction will consolidate leased facilities and reduce contractor support for the following areas: learning analytics, microlearning mobile-learning platform, enterprise learner record repository, and DoD learning-at-scale strategy. The reframed program will sustain technical assessment of, and limited R&D for, learning data standards and interoperability (across DoD, Federal Government, and industry), Digital Learning Modernization reforms, DoD distributed learning requirements collection, and the learning services ecosystem. It will also retain the program’s Department-wide distributed learning technology and policy advisory role focused on ensuring technology/data standards alignment across DoD. The FY2021 reduction is offset by an administrative zero-sum transfer ($3.0 million) from PE 0804767D8Z (i.e., Combatant Commander Exercise Engagement and Training Transformation [CE2T2] from The Joint Staff [TJS]). | | | |
| **Accomplishments/Planned Programs Subtotals** | 13.414 | 22.446 | 6.765 |

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| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603769D8Z / *Advanced Distributed Learning* |

**D. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**E. Acquisition Strategy**

N/A

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603781D8Z / *Software Engineering Institute (SEI)* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 14.468 | 15.016 | 15.111 | 12.598 | - | 12.598 | 12.825 | 13.090 | 13.491 | 13.816 | Continuing | Continuing |
| 781: *Software Engineering Institute (SEI)* | 14.468 | 14.016 | 14.114 | 12.598 | - | 12.598 | 12.825 | 13.090 | 13.491 | 13.816 | Continuing | Continuing |
| 816: *Cyber Security* | 0.000 | 1.000 | 0.997 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

**Note**

The Software Engineering Institute (SEI) Advanced Technology Development Program Element (PE) applies the software and computer science concepts developed under the 0602751D8Z PE to research, develop, and rapidly transition state-of-the-art software technology, tools, development environments, and best practices to improve the engineering, management, fielding, evolution, acquisition, and sustainment of software-intensive DoD systems.

**A. Mission Description and Budget Item Justification**

Software is more pervasive than ever, and computer programs are growing in size and complexity. Designing, managing, and securing integrated, complex, and large-scale mission-critical systems are abilities that the DoD and the Defense Industrial Base (DIB) have not yet mastered. Reliance on software-intensive mobile and net-based products and systems has increased (e.g., Joint Tactical Radio System, USS ZUMWALT (DDG-1000), Joint Strike Fighter, F-22, and Army Modernization). As stated in the February 2018 Defense Science Board Report, “Design and Acquisition of Software for Defense Systems,” software is a crucial and growing part of weapons systems and the national security mission, and the DoD must address its ability to build and sustain software continuously and indefinitely. With growing global parity in software engineering, the DoD must maintain leadership to ensure a competitive advantage.

The Software Engineering Institute (SEI) Federally Funded Research and Development Center (FFRDC) was established in 1984 as an integral part of the DoD’s initiative to identify, evaluate, and transition software engineering technologies and practices. The mission of the SEI is to provide the DoD with technical leadership and innovation through research and development to advance the practice of software engineering and technology. The SEI works across government, industry, and academia to improve the state of software engineering from the technical, acquisition, and management perspectives. The SEI engages in research and development of critical software technologies and tools and collaborates with the larger software engineering research community. It facilitates rapid transition of software engineering technologies into practice and evaluates emerging software engineering technologies to determine their potential for improving software-intensive DoD systems. Since its inception, the SEI has helped to transform the fields of software engineering and acquisition, network security, real-time systems, software architectures, and software-engineering process management.

The SEI Program Element (PE) addresses the critical need to research, develop, and rapidly transition state-of-the-art software technology, tools, development environments, and best practices to improve the engineering, management, fielding, evolution, acquisition, and sustainment of software-intensive DoD systems. The research conducted by this PE directly benefits the technical domains such as Command, Control, Communications, Computers, and Intelligence (C4I), Autonomy and Artificial Intelligence (AI), Cyber, and Engineered Resilient Systems.

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
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| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603781D8Z / *Software Engineering Institute (SEI)* |

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 15.016 | 15.111 | 15.239 | - | 15.239 |
| Current President's Budget | 15.016 | 15.111 | 12.598 | - | 12.598 |
| Total Adjustments | 0.000 | 0.000 | -2.641 | - | -2.641 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | - | - | | | |
| • Other | - | - | -0.126 | - | -0.126 |
| • Economic Assumption | - | - | -0.015 | - | -0.015 |
| • Reduction for Defense Wide Review | - | - | -2.500 | - | -2.500 |

**Change Summary Explanation**

Defense-Wide Review: The FY 2021 funding request was reduced by $2.500 million during DWR to realign funds for higher priority DoD missions.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | | | | | | | | | Date: February 2020 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 3 | | | | | R-1 Program Element (Number/Name)<br>PE 0603781D8Z / *Software Engineering Institute (SEI)* | | | | Project (Number/Name)<br>781 / *Software Engineering Institute (SEI)* | | | |
| **COST ($ in Millions)** | **Prior Years** | **FY 2019** | **FY 2020** | **FY 2021 Base** | **FY 2021 OCO** | **FY 2021 Total** | **FY 2022** | **FY 2023** | **FY 2024** | **FY 2025** | **Cost To Complete** | **Total Cost** |
| 781: *Software Engineering Institute (SEI)* | 14.468 | 14.016 | 14.114 | 12.598 | - | 12.598 | 12.825 | 13.090 | 13.491 | 13.816 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

This project focuses on two main research thrusts with known military applications: (1) Software Engineering, Systems Verification and Validation, and Mission Assurance (formerly Mission Assurance); and (2) Information Assurance.

SEI research focuses on the most significant and pervasive software challenges within the DoD, such as the scalability and reliability of software assurance, supply chain risk management, validation of and trust in autonomous systems, human-computer and human-technology teaming and interaction, computing and communication at the tactical edge, and efficiency and performance of acquisition strategies and software development appropriate for a contested cyber environment.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Software Engineering Institute Advanced Technology Development in the Area of Software Engineering, Systems Verification and Validation, and Mission Assurance | 9.716 | 9.881 | 10.826 |
| ***Description:*** This research seeks to mature and rapidly prototype techniques to verify methods for identifying requirements, systems of systems architectures, and virtual integration of components. Furthermore, research in this area will pursue rapid prototyping and transitioning of capabilities that verify requirements for software assurance, analysis/control of unverified code and automated repair of damaged code. Software production and code analysis methods developed through this program will also improve the ability to predict how complex software systems, including AI-enabled systems, will behave in untested environments. Increasingly, large numbers of lines of code and the addition of machine-learning techniques will require a commensurate increase in sophisticated verification and validation mechanisms. | | | |
| ***FY 2020 Plans:***<br>• Develop methods and prototypes for verifying timing properties of software executing on multiple cores of a processor.<br>• Automate the fielding and deployment of machine learning algorithms on novel computing architectures to allow faster and cheaper software capabilities as well as the realization of performance improvements within the hardware. | | | |
| ***FY 2021 Plans:***<br>• Verify and extend conformance checking for design properties of for DoD systems and software, demonstrating a reduction in the mean time required to detect design non-conformance from months to hours.<br>• Prototype an AI test harness that enables developers to elicit requirements and conduct an independent verification of the security properties of the neural network components through unit, integration, and uncertainty tests. | | | |
| ***FY 2020 to FY 2021 Increase/Decrease Statement:*** | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603781D8Z / *Software Engineering Institute (SEI)* | **Project (Number/Name)**<br>781 / *Software Engineering Institute (SEI)* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| The increase in budget from FY 2020 to FY 2021 reflects additional resources required for prototype development. | | | |
| ***Title:*** Software Engineering Institute Advanced Technology Development in the Area of Information Assurance | 4.300 | 4.233 | 1.772 |
| ***Description:*** Powerful machine learning algorithms can be subverted by malicious manipulation or falsification of data collected through normal channels. Algorithms must be trusted and effective in the presence of adversaries. This thrust seeks to defend against and minimize the impacts of information falsification attacks.<br><br>***FY 2020 Plans:***<br>• Prototype verified enforcers that prioritize mission critical functions while assuring component behavior to enable use of unverified commodity software components in military autonomous systems<br>• Prototype a system that implements new algorithms and measures the effectiveness of classifier precision, classifier recall, and reused adjudications.<br>• Prototype techniques to verify evasion defenses from post-training adversarial inputs as an integrated part of a continuous integration lifecycle to reduce the number of weaknesses.<br><br>***FY 2021 Plans:***<br>• Create an AI test harness enabling software engineers to elicit requirements and conduct an independent verification of the security properties of neural network components through unit, integration, and uncertainty tests.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The decrease in information assurance technology research is due to a need to leverage existing spending by the DoD services and focus on more fundamental research in this area. | | | |
| **Accomplishments/Planned Programs Subtotals** | 14.016 | 14.114 | 12.598 |

**C. Other Program Funding Summary ($ in Millions)**

| Line Item | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|
| • BA 2, PE # 0602751D8Z: *Software Engineering Institute Applied Research* | 9.279 | 9.580 | 9.573 | - | 9.573 | 9.712 | 9.749 | 10.001 | 10.204 | Continuing | Continuing |

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 3 | R-1 Program Element (Number/Name)<br>PE 0603781D8Z / *Software Engineering Institute (SEI)* | Project (Number/Name)<br>816 / *Cyber Security* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 816: *Cyber Security* | 0.000 | 1.000 | 0.997 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

SEI research focuses on the most significant and pervasive cybersecurity challenges within the DoD, such as the scalability and reliability of software assurance, supply chain risk management, validation of and trust in autonomous systems, human-computer and human-technology teaming and interaction, computing and communication at the tactical edge, and efficiency and performance of acquisition strategies and software development appropriate for a contested cyber environment.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Cyber Security | 1.000 | 0.997 | - |
| ***Description:*** DoD network-centric and data-dependent autonomous systems are currently developed with a focus on function rather than security. This approach makes them particularly vulnerable to cyber-attacks, a risk we seek to mitigate by developing, prototyping, and demonstrating new tools, technologies, and techniques to increase their cyber security.<br><br>***FY 2020 Plans:***<br>• Prototype DoD specific secure DevOps process, to include integration of advanced techniques and mission requirements that exceed commercial industry norms and capabilities.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funds re-aligned for other DoD priorities. | | | |
| **Accomplishments/Planned Programs Subtotals** | 1.000 | 0.997 | - |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603826D8Z / *Quick Reaction Special Projects (QRSP)* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 469.939 | 57.004 | 35.647 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| 826: *Quick Reaction Fund* | 145.237 | 18.499 | 0.000 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| 828: *Rapid Reaction Fund* | 311.697 | 36.182 | 33.296 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| 833: *Strategic Multi-Layered Assessment (SMA) Support* | 13.005 | 2.323 | 2.351 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

**Note**

In FY 2021, all funding and project investment areas in the Quick Reaction Special Projects (QRSP) Program Element (PE) will transition to PE 0603338D8Z Defense Modernization and Prototyping. The new PE will continue to leverage the year of execution processes that allow QRSP to rapidly develop relatively low cost, risk reducing prototypes for potentially high payoff opportunities. Through consolidation, the PE increases the Department's ability to coordinate activities across the Services and Defense Agencies, removes duplication of effort, enables rapid pivots to new threats, and provides the resources necessary to ensure technological overmatch against future threats. This realignment directly supports the Department's modernization plans by streamlining investments, reducing the time from discovery to deployment, and enabling development of disruptive technologies to help realize the National Defense Strategy.

Funding in the QRSP PE enables leadership within the Office of the Under Secretary of Defense for Research and Engineering (OUSD(R&E)) to leverage rapidly maturing technologies from small and non-traditional businesses within the year of execution and incubate them to potentially game-changing capabilities. Through streamlined processes, QRSP captures emergent opportunities and addresses time sensitive mission threats through low cost, higher-risk prototypes.

In FY 2020, the Quick Reaction Fund (QRF) within the QRSP PE was transferred to PE 0603699D8Z Emerging Capabilities Technology Development to support the priorities of the Under Secretary of Defense for Research and Engineering (USD(R&E)). Additionally, in FY 2020 the Joint Rapid Acquisition Cell Support (JRAC) was transferred to PE 0903399D8Z within the Office of the Under Secretary of Defense for Acquisition and Sustainment for alignment and execution. To support the transition of JRAC to the Office of the Under Secretary of Defense for Acquisition and Sustainment, previously appropriated funding for JRAC is displayed within the Rapid Reaction Fund.

**A. Mission Description and Budget Item Justification**

The Quick Reaction Special Projects (QRSP) Program Element (PE) funds the development of risk-reducing prototypes and accelerates capability innovation to deliver performance to the joint warfighter at the speed of relevance. QRSP prototypes increase warfighter lethality, affordably counter emerging technological threats, and help address the immediate needs of the Combatant Commands (CCMD). Due to the relatively low average cost of projects, QRSP is able to explore higher-risk opportunities with potentially higher reward. Project selection is guided by Department-level strategies and priorities, such as the National Defense Strategy, the Chairman's Capability Gap Assessment, the Department of Defense's (DoD) modernization priorities, and the CCMD's Integrated Priority Lists (IPLs).

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603826D8Z / *Quick Reaction Special Projects (QRSP)* |

The QRSP Program supports four major project codes that expedite development and transition of new capabilities to the warfighter. These project codes are: 1) Quick Reaction Fund (QRF), 2) Rapid Reaction Fund (RRF), 3) Joint Rapid Acquisition Cell (JRAC) support, and 4) Strategic Multi-Layered Assessment (SMA). Efforts within these project codes align to DoD science and technology priorities, address challenges identified in the National Defense Strategy, and support the DoD's modernization priorities. Funding and activities within QRF transferred to other Program Elements in FY 2020.

RRF develops prototypes to counter emerging threats; anticipates adversaries' exploitation of new technologies; and, expedites delivery of effective, affordable, and critically needed capabilities to the warfighter. RRF initiatives accelerate innovation by rapidly developing high-risk prototypes with the potential for immediate and impactful transition of warfighter capabilities. RRF leverages emerging capabilities, such as machine learning algorithms and software intelligence, to enable novel prototypes with agile technology insertion paths. Funded projects also leverage existing capabilities from the traditional industrial base and non-traditional suppliers in the commercial sector, academia, international arenas, and small businesses.

SMA supports senior leadership within the CCMDs, Joint Force Commanders, and other government agencies by assessing complex operational and technical challenges, which require collaborative multi-agency and multi-disciplinary approaches. With input from across the U.S. government, academia, and the private sector, the SMA develops options to Joint Staff and CCMD-generated challenging problems to inform senior leadership. Each assessment is initiated at the request of CCMD senior leadership. The Joint Staff Deputy Director for Global Operations (DDGO) sets priorities for SMA programs. SMA products are typically generated within six to nine months and directly contribute to the decision-making process of the Joint Staff and CCMD senior leadership.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 59.490 | 47.147 | 48.828 | - | 48.828 |
| Current President's Budget | 57.004 | 35.647 | 0.000 | - | 0.000 |
| Total Adjustments | -2.486 | -11.500 | -48.828 | - | -48.828 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | -11.500 | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | -0.500 | - | | | |
| • SBIR/STTR Transfer | -1.976 | - | | | |
| • Transfer to Defense Modernization and Prototyping PE | - | - | -48.828 | - | -48.828 |
| • Other Program Adjustments | -0.010 | - | - | - | - |

**Change Summary Explanation**

The FY 2020 Congressional reduction of $11.500 million was directed for Prior year carryover.

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603826D8Z *I Quick Reaction Special Projects (QRSP)* |

The FY 2021 baseline reduction is the transfer out of QRSP resources to PE 0603338D8Z Defense Modernization and Prototyping to provide alignment, transparency and focus supporting development of key technologies and modernization within OUSD(R&E) identified capability thrust priorities.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 3 | R-1 Program Element (Number/Name)<br>PE 0603826D8Z / *Quick Reaction Special Projects (QRSP)* | Project (Number/Name)<br>826 / *Quick Reaction Fund* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 826: *Quick Reaction Fund* | 145.237 | 18.499 | 0.000 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

**Note**

In FY 2020, the Quick Reaction Fund (QRF) was transferred to Program Element 0603699D8Z Emerging Capabilities Technology Development. There were no new projects and only FY 2019 close out activities are reported.

**A. Mission Description and Budget Item Justification**

The Quick Reaction Fund (QRF) provided the Combatant Commands (CCMDs), Services, and joint warfighters opportunities to capitalize on relatively mature technologies. QRF leveraged maturing technology to rapidly prototype and field-test promising new prototypes that have immediate impact on time-sensitive operational needs. Capabilities addressed National Defense Strategy priorities and informed programs of record or new acquisition pathways to more effectively and affordably push innovation to the field. QRF focused on projects that have the potential to address conventional, disruptive, and asymmetric warfare needs. QRF initiatives typically delivered a prototype application within 12 months of being funded. In FY 2020, QRF funds transferred to PE 0603699D8Z Emerging Capabilities Technology Development to facilitate rapid prototyping and experimentation to support the DoD's modernization priorities.

Recent success stories and significant transitions of note include:

• Vintage Racer matured an advanced capability to prosecute targets of interest. The project successfully validated aerodynamic design with wind tunnel testing and integrated a guidance subsystem for targeted kinetic effects before culminating in a FY 2019 flight test. Documentation and prototype technologies transitioned to the U.S. Army for additional development and follow-on acquisition activities.

• Dead Center demonstrated advanced, highly tailorable algorithms to meet critical warfighter mission needs in multiple domains, culminating in a user demonstration of the advanced algorithms designed to enhance warfighter effectiveness. The project integrated these algorithms with repurposed commercial-off-the-shelf (COTS) hardware to demonstrate a flexible, multi-platform functionality in a low size, weight, and power form factor to meet specific, highly tailored mission critical needs. Project deliverables, including prototypes and system documentation, transitioned to a classified DoD partner.

• Battle Axe was a nine-month effort that leveraged several existing, high technology readiness level (TRL) technologies and developed a new, electronic-attack (EA) capability. The prototype provided a rapidly deployable, low size, weight, power, and cost counter intelligence, surveillance, and reconnaissance (ISR) solution to the warfighter. Further details of this project are classified.

• Olympus focused on the development of fully customizable cyber tools for open network exploitation to enhance the CCMDs' capability to operate and exploit cyber information in near real-time. The solution leveraged best practices of the U.S. Government's cyber workforce and expanded the capability of the DoD to operate in cyber space with government-off-the-shelf (GOTS) customized software tools. Further details of this project are classified.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Red Dawn Phase II | 2.320 | - | - |
| ***Description:*** Red Dawn enabled greater visibility into threat indications and warnings (I&W) through the integration of existing data sources and advanced data science techniques. Red Dawn Phase II developed enhanced I&W visualization tools and | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603826D8Z / *Quick Reaction Special Projects (QRSP)* | **Project (Number/Name)**<br>826 / *Quick Reaction Fund* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| analytics for the warfighter providing the users with greater situational awareness. Additionally, this project ensured a two-way flow of information with existing, on-going efforts. Red Dawn transitioned to the U.S. European Command (USEUCOM) and other DoD agencies. | | | |
| ***Title:*** Ballistic Missile Defense (BMD) Visualization Support Tool<br>***Description:*** The BMD Visualization Support Tool provides timely, tailored, and fused information that enables the Commander, U.S. Northern Command (USNORTHCOM) to provide the President of the United States and senior White House officials with BMD visuals during time-urgent events. The project developed a working prototype that resides on the Secure Internet Protocol Router (SIPR) network, conducted modifications based on feedback from the user community, and supported user community exercises. The tool transitioned to the North American Aerospace Defense Command (NORAD)/USNORTHCOM. | 1.550 | - | - |
| ***Title:*** Predictive Analytics for Condition Based Maintenance<br>***Description:*** Predictive Analytics demonstrated the ability to apply predicative models for maintenance on legacy ground combat equipment to enhance lethality through improved readiness. The prototype system collects and stores engine performance data and fault codes, applies machine learning principles to collected data, and anticipates required maintenance before issues cause expensive damage to engine hardware. Prototyping focused on building a framework to understand engine data from the M-88 platform and extrapolating actionable steps. The prototype transitioned to the U.S. Marine Corps for further development and assessment. This prototype also supports the M-1 tank chassis and was leveraged by the U.S. Army tank fleet. | 0.750 | - | - |
| ***Title:*** MANGO SALSA<br>***Description:*** MANGO SALSA advanced the development and deployment of novel signature reduction technology for end user evaluation. MANGO SALSA enhances the CCMDs' capability to operate and execute missions. With this capability, the warfighter has the ability to alter signatures via low power, lightweight systems tolerant of typical environmental conditions. The solution demonstrated reduced signatures for military vehicles and advanced the DoD modernization priority for microelectronics. Further details of this project are classified. | 2.400 | - | - |
| ***Title:*** Project 419<br>***Description:*** Project 419 demonstrated an end-to-end collection system to address ongoing information needs. The project resulted in a limited operational capability for critical information that otherwise would be disrupted due to resource outages or conflicting tasking. Using existing assets, Project 419 provided initial operations collection via a unique sensor system. It also leverages long-dwell to enable an advanced capability with the potential to characterize critical undiscovered signals of interest for CCMDs and intelligence agencies. | 2.600 | - | - |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603826D8Z / *Quick Reaction Special Projects (QRSP)* | **Project (Number/Name)**<br>826 / *Quick Reaction Fund* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Wildwood<br>***Description:*** Wildwood provided solutions to the widespread cyber challenges faced by DoD and the Defense Industrial Base (DIB) that are the legacy of Advanced Research Projects Agency Network (ARPANET), Transmission Control Protocol (TCP), and other systems initially designed for small trusted enclaves. Wildwood developed, tested, and deployed a network of spatially diverse nodes on the open internet for experimentation, measurement, testing, and modeling of a proposed network technology, architecture, and hardware that breaks with the historic internet paradigm. Wildwood enables replacement of the current security model by moving from a reactionary profile to a well-designed, defensible, high-speed network architecture that can provide privacy in both fact of transmission and content in traffic. A fully deployed system will radically reduce the cyber vulnerability footprint, without requiring redesign of the legacy, currently vulnerable system, and will reduce the cost of security imposed on DoD, DIB, and civilian systems. Wildwood transitioned to Missile Defense Agency and a classified DoD partner for further development and implementation of a fully deployed system. | 2.000 | - | - |
| ***Title:*** Project Hornet<br>***Description:*** Project Hornet developed and tested an advanced, hand-launched unmanned aerial system (UAS) that can be used by forward-deployed personnel to interdict and disrupt adversary electronic capabilities in contested environments. The UAS platform provides Special Operations Forces (SOF), along with Service and Interagency partners, with a versatile, adaptive capability that can be applied to a diverse range of adversary electronic threats. After a successful demonstration, Project Hornet transitioned to U.S. Army Special Operations Command (USASOC), which intends to use flexible acquisition authorities to rapidly transition the capability to the broader SOF community. Further details of this project are classified. | 1.279 | - | - |
| ***Title:*** Ghost Chronograph<br>***Description:*** Ghost Chronograph is an engineering design prototype and validation study to identify key requirements for next generation adaptive array algorithms to overcome limitations in current electronic warfare (EW) systems. The design refined key performance parameters including differential geometry effects, transmit and receive parameters, atmospheric variations, energy characterization, and power density that determine the performance and limitations of robust EW systems across the electromagnetic spectrum. The design transitioned to United States Indo-Pacific Command (INDOPACOM) and Pacific Air Forces (PACAF) to inform an operational system that combines discontinuous spectrum channels to provide higher bandwidth and robustness. Further details of this project are classified. | 0.300 | - | - |
| ***Title:*** Lightweight Remote Weapons System (LRWS)<br>***Description:*** LRWS rapidly developed and evaluated a remote weapon station (RWS) with significant size weight and power reduction to enable operations on remotely operated small ground vehicles. LRWS reduced the swap of current crewed weapon systems from 350lbs to 70lbs with equivalent lethality. LRWS includes sensor integration such as a daytime zoom camera, | 1.200 | - | - |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
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| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603826D8Z / *Quick Reaction Special Projects (QRSP)* | **Project (Number/Name)**<br>826 / *Quick Reaction Fund* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| thermal imager, laser range finder to enable rapid targeting and man-in-the-loop engagement within seconds of detecting a target within the azimuth range of 360 degrees, elevation ranges of 60 degrees up and 20 degrees down. LRWS uses advanced algorithms to compensate for ammunition, range, and camera parallax and supports 5.56mm, 7.62mm, and .50 caliber ammunition. LRWS transitioned to U.S. Special Operations Command (USSOCOM) for immediate force protection of SOF operators while conducting the operational evaluation of the prototype units and will subsequently be available to all operators within the USSOCOM, and through the U.S. Army Combat Capabilities Development Command Armament Center (CCDC (AC)) and Product Manager Crew Served Weapons (PM CSW). | | | |
| ***Title:*** Enhanced Blast Artillery Projectile (EBAP)<br>***Description:*** EBAP is a 155mm artillery projectile prototype leveraging advanced technologies to demonstrate significant lethality enhancements. The project incorporates an innovative explosive charge configuration with hybrid enhanced blast explosive (HEBX) and a high density reactive material (HDRM) to generate enhanced blast and overpressure effects coupled with an increased high temperature duration. This design produces catastrophic damage compared to existing 155mm high explosive artillery projectiles, allowing for less rounds to be used and visual confirmation of damage on a target. The EBAP project developed the prototype and culminated in a large-scale static-arena test for a vehicle target, demonstrating its destructive effects. EBAP transitioned to the U.S. Marine Corps for user evaluation and the Office of Naval Research for further development. | 2.700 | - | - |
| ***Title:*** Project VANGUARD 2.0<br>***Description:*** VANGUARD developed a virtual reality environment for enhanced operational collaboration for disparate, geographically separated organizations and personnel. The environment was developed as an unclassified demonstration to enable rapid development and integration of commercially based visual mapping and analytical tools. Project VANGUARD 2.0 efforts focused on extending this tool to a classified environment with the ability to ensure connectivity across disparate databases with differing security. The end result provides direct support of targeting analysts and decision makers during the targeting process, and brings together U.S. Army and U.S. Air Force objectives in a joint initiative. In 2019, the system was deployed across 363 Intelligence, Surveillance, and Reconnaissance Wing subordinate units and assets. | 1.400 | - | - |
| **Accomplishments/Planned Programs Subtotals** | 18.499 | - | - |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
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**D. Acquisition Strategy**

QRF leverages the Services' and Defense Agencies' most efficient and effective acquisition approach for rapid prototyping. This includes using Other Transaction Authorities and new or existing contract vehicles.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 3 | R-1 Program Element (Number/Name)<br>PE 0603826D8Z / *Quick Reaction Special Projects (QRSP)* | Project (Number/Name)<br>828 / *Rapid Reaction Fund* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 828: *Rapid Reaction Fund* | 311.697 | 36.182 | 33.296 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

**Note**

In FY 2021, the Rapid Reaction Fund (RRF) will transition to PE 0603338D8Z Defense Modernization and Prototyping. This realignment directly supports the Department's modernization plans by streamlining investments, reducing the time from discovery to deployment, and enabling development of disruptive technologies to help realize the National Defense Strategy.

**A. Mission Description and Budget Item Justification**

The Rapid Reaction Fund (RRF) produces innovative prototypes with a high potential for disruptive improvement and transitions them to joint warfighters and Combatant Commands (CCMDs). RRF's streamlined business processes address mission gaps through partnerships with small and non-traditional companies, Service labs, Federally Funded Research and Development Centers, allied nations, and transition partners within the warfighter user community. RRF anticipates adversaries' exploitation of technology, including current and emerging commercial capabilities, and rapidly responds to new threats and opportunities. Project selection is guided by department-level strategies and priorities, such as the National Defense Strategy and the DoD's modernization areas. Needs are identified and prototype projects are funded within the year of execution to demonstrate the feasibility of new technologies, enable integration into larger systems, and deliver affordable capabilities faster than standard acquisition cycles. RRF prototypes inform future acquisition or transition through rapid technology refresh and insertion into joint mission capabilities. These lower-cost prototypes and innovative business processes give the Under Secretary of Defense for Research and Engineering (USD(R&E)) the agility to quickly explore new, higher-risk technology areas that have the potential for immediate, game-changing impacts.

In prior years, RRF supported the creation of novel sensing systems; provided low-cost capabilities for small-footprint operations; expanded human, social, and cultural knowledge relevant to military decision making; increased small unit situational awareness; produced advanced biometrics and forensics capabilities; performed strategic multi-layer assessments; and, established a prototyping through non-traditional pathways outreach effort that facilitates better interactions with small, non-traditional companies developing innovative technologies. In FY 2020, RRF continues to support the USD(R&E) and provides a hedge against technology risk by identifying and delivering near-term capabilities to support irregular warfare operations.

Recent success stories and significant transitions of note include:
• Reduced Acoustic Signature Propellers prototyped and implemented quieter propellers for covert Unmanned Aerial System (UAS) mission sets. The technology transitioned to U.S. Special Operations Command (USSOCOM) and U.S. Army Special Operations Command (USASOC).
• Passive Foliage Penetration developed novel data processing algorithms to image targets under foliage from airborne platform passive video. The technology successfully transitioned to multiple partners including U.S. Indo-Pacific Command (USINDOPACOM) and U.S. Southern Command (USSOUTHCOM).
• Ordnance Threat/Target Automated Recognition developed deep learning based algorithms to identify military ordnance. This effort directly supports the joint explosive ordnance disposal (EOD) mission by increasing the technician's confidence level and safety. The technology transitioned to the Joint Service EOD Program.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
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| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603826D8Z / *Quick Reaction Special Projects (QRSP)* | **Project (Number/Name)**<br>828 / *Rapid Reaction Fund* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Low Cost Innovative Projects (Projects less than one million dollars each) | 27.983 | - | - |
| ***Description:*** Typical Rapid Reaction Fund (RRF) projects are completed with a single year of funding and at a cost less than $1.000 million to deliver conceptual prototypes for evaluation or assessment by warfighters and interagency users. In FY 2019, RRF selected, executed, and transitioned multiple low cost projects, including:<br>• Compact Expendable Payload: A project that developed off-board expendable countermeasures for High Value Assets (HVA). The resulting prototypes successfully transitioned to the U.S. Air Force's Air Mobility Command and the U.S. Air National Guard.<br>• BiAS for Unmanned Underwater Vehicles (UUVs): UUV prototypes, which successfully transitioned to USINDOPACOM and U.S. Pacific Fleet.<br>• Modular Multi-Platform Intrusion Detection System (MMIDS): Government-owned open systems architecture that combats cyber threats in air and surface vehicles in addition to monitoring networks for malicious activities. This technology transitioned to the U.S. Navy Exploratory Development Lab, the U.S. Army's Next Generation Combat Vehicle (NGCV) program, and the U.S. Air Force Research Laboratory.<br>• SPRINT: This technology provides a novel approach to enable detection and geolocation of targets of interest. It successfully transitioned to USINDOPACOM and USEUCOM.<br>• BANSHEE: A machine learning technique that provides improved topological models. This product is transitioning successfully to end users.<br>• Ion Electrospray Micro Propulsion: A novel nanoscale propulsion system that allows for high thrust, enabling needed agility in space. This program successfully transitioned to multiple U.S. government agencies.<br>• Pathfinder: A special purpose High Frequency Radar (HFR) to advance capabilities against targets of interest. The capability is used by multiple CCMDs.<br>• Quicksilver: A non-traditional technology application that provides capability to the warfighter against remote controlled improvised explosive device (RCIED). This capability transitioned to Navy PMS-408, Unmanned Ground Vehicles.<br>• Response for Tactical Logistics: A platform that uses weapon sensors to improve decision making and reduce logistic response times. Further development is being performed by the U.S. Army Armament Research, Development, and Engineering Center.<br>• Project 422: A technology application that provides the end user the ability to use alternate antenna and processing systems. This project successfully transitioned to a classified U.S. government customer.<br>• Impulsive: A novel propellant additive, which drastically improves missile range. The U.S. Air Force is currently using the system.<br>• Compact Microelectromechanical Systems (MEMS) Light Detection and Ranging (LiDAR): A compact MEMS switching LiDAR for all combat conditions. This LiDAR successfully transitioned to the Joint Program Executive Office for Chemical Biological Defense (JPEO-CBD).<br>• Multi-Static Distributed Radar: A high-resolution target tracking system for Unmanned Aerial Systems (UAS) and manned aircraft. The radar successfully transitioned to USSOUTHCOM. | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
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| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603826D8Z / *Quick Reaction Special Projects (QRSP)* | **Project (Number/Name)**<br>828 / *Rapid Reaction Fund* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| • SmartFog: Computing software that leverages existing sensors and provides advanced computing power at the battlefield edge. This software transitioned to USSOCOM.<br>• Differential Segmented Aperture: A new technology that provides full spectrum radio frequency (RF) capabilities and increased antenna efficiency. This product transitioned to the U.S. Army Intelligence and Security Command.<br>• Gray Zone Intelligence, Surveillance, and Reconnaissance (ISR): This cyber technology allows for the early detection, characterization, and warning of Gray Zone intelligence operations. The cyber tool transitioned to the Joint Warfare Analysis Center (JWAC).<br>• Joint AVAA Workflows (JAWs) Phase 2: An autonomous solution designed to help analysts exploit motion imagery data. Phase 2 focused on implementing changes based on user feedback. JAWs is being used by the U.S. Africa Command, the National Geospatial Agency, and other agencies.<br>• Virtual Raptor: A data fusion tool to generate timely visualizations using machine learning algorithms. Virtual Raptor allow users to analyze and interact with seemingly unrelated data to extract vital mission information. U.S. Special Operations Command is using this software.<br>• Canine Head Mounted Display: A tactically relevant head mounted display (HMD) for military working dogs. The Canine Head Mounted Display allows the handler to remotely and covertly identify objects of interest during covert operations. This technology transitioned to Naval Special Warfare Command.<br>• Adaptive Precision Navigation and Timing (PNT) Hub: A novel precision timing hardware fusion engine that enables plug-and-play integration across a wide spectrum of electronics and PNT solutions. This capability deployed to a classified transition partner.<br>• Modular Air Dropped Package (MAD PACK): A novel rotorcraft unmanned aerial system (UAS) that can be deployed from a common launch tube (CLT). The technology transitioned to, and is in use by, the U.S. Air Force.<br>• Pebble: This project developed a wire free, unobtrusive mouthpiece communication device. This technology is currently in use by U.S. Special Operations Command.<br>• Single Tag: A data triage tool that uses classical data processing algorithms to rapidly clean, sort, and label data. This technology enables convolutional neural networks (CNNs) to be trained much more quickly with minimal analyst input. This technology is currently in use by the National Geospatial Agency.<br>• Unmanned Aerial Systems (UAS) Discrimination: This LiDAR project provides the capability to quickly and accurately discriminate between biologicals and UAS. This product is being used by multiple DoD installations.<br>• Digital EOD: A project that used artificial intelligence/machine learning (AI/ML) to quickly deliver pertinent information regarding unexploded ordnance. This project transitioned to Joint Service EOD.<br>• ARM-ANTS: A project that used the Advanced Anti-Radiation Guided Missile (AARGM) as a non-traditional sensor. This project transitioned to the U.S. Air Force. | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
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| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603826D8Z / *Quick Reaction Special Projects (QRSP)* | **Project (Number/Name)**<br>828 / *Rapid Reaction Fund* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| • High Performance Solid Rocket Propellant: A project that developed a novel aluminum-lithium (Al-Li) alloy fuel that, in addition to significantly increasing performance and munition range, removes a dangerous emission common in current state-of-the-art formulations. This project successfully transitioned to the U.S. Army.<br>• ALICE: This project demonstrated a software tool that can assess deficiencies in AI/ML trained algorithms. It provides a method to evaluate and efficiently re-train the performance of Convolutional Neural Networks (CNNs). This project technology successfully transitioned to the Joint Artificial Intelligence Center (JAIC).<br>• HLX Drive: The Helix crankshaft combined with variable power on demand (VPOD) allows for much greater power with reduced weight. The HLX Drive project demonstrated a 3kW generator that weighs 80 percent less than the current generator while increasing power output by 33 percent. This technology transitioned to the U.S. Marine Corps.<br>• RF Gatekeeper: A system that automatically identifies and suppresses interference in congested radio frequency environments, maintaining performance of mission critical communication systems. This technology transitioned to United States Special Operations Command.<br>• Intelligent Power Distribution System: This project embeds AI/ML capability into Intelligent Power Distribution Units (IPDUs), so that these units can react if there are signs of imminent system failure. This project successfully transitioned to the U.S. Army. | | | |
| ***Title:*** Strategic Multi-Layered Assessment (SMA) Reach Back Cell | 2.000 | 2.000 | - |
| ***Description:*** The SMA Cell supports senior leadership in the Combatant Commands (CCMDs) and at U.S. Government agencies with actionable assessments of complex operational and technical challenges. The assessments help maintain our competitive advantage in an increasingly complex global environment. The SMA Cell was established by the Joint Staff Deputy Director for Global Operations at the request of the Commander, U.S. Central Command (USCENTCOM). SMA efforts leverage multi-agency, multi-disciplinary approaches to address requirements that are not within the customer organization's core competency. SMA assessments are framed during the year of execution and are in response to specific tasking from senior leadership in the CCMDs. The SMA Cell identifies options from across the U.S. Government, academia, and the private sector. SMA efforts are facilitated by the Joint Chiefs of Staff/J-3 Operations and are executed by the Office of the Under Secretary of Defense, Research and Engineering. The SMA Cell provides USCENTCOM with population-based and regional expertise in support of ongoing operations in the USCENTCOM area of responsibility.<br><br>***FY 2020 Plans:***<br>The SMA Cell will continue to actively work with the CCMDs and the Joint Staff to identify challenging problems that are not within the traditional areas of DoD expertise. These problems will be in direct support of CCMD senior leadership. | | | |
| ***FY 2020 to FY 2021 Increase/Decrease Statement:*** | | | |

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| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603826D8Z / *Quick Reaction Special Projects (QRSP)* | **Project (Number/Name)**<br>828 / *Rapid Reaction Fund* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| In FY 2021, the SMA Cell will transition to PE 0603338D8Z Defense Modernization and Prototyping. The realignment of the SMA Cell will not change the objective of providing support to the CCMDs or influencing acquisition programs resulting from identified needs. | | | |
| ***Title:*** Tactical Grade Inertial Measurement Unit (IMU)<br><br>***Description:*** Tactical Grade IMU develops a single chip, millimeter-scale, tactical grade IMU with a total power requirement of <150 µW and capability of surviving in a >20,000 g shock environment. This represents a 1,000x reduction in volume and 10,000x reduction in power, and enables IMU guidance on small caliber munitions. A mm-scale tactical grade IMU would improve navigation in GPS-contested environments for small caliber munitions such as the Army Precision Guidance Kit–Anti-Jam (PGK-AJ), XM1155, and Excalibur HTK, along with the Navy Moving Target Artillery Round (MTAR).<br><br>***FY 2020 Plans:***<br>In 2020, the IMU will be fabricated and integrated to transition partner specifications prior to testing on U.S. Army provided ranges. The resulting IMU will transition to the U.S. Army Combat Capabilities Development Command (CCDC). The Government will maintain Government purpose rights for all intellectual property developed during this project.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Tactical Grade Inertial Measurement Unit will be completed in 2020 and transitioned to U.S. Army Futures Command. | 1.530 | 1.500 | - |
| ***Title:*** Prototyping Through Non-Traditional Pathways<br><br>***Description:*** Prototyping Through Non-Traditional Pathways leverages technologies and emerging products developed by small, innovative businesses in the commercial sector including information technologies; internet-of-things sensors and adaptive networks; bio-medical advances; emerging quantum applications; and, novel microelectronic/microelectromechanical system innovations. The project identifies ideas from non-traditional emerging technology companies that match DoD, CCMD, Service, and other government priorities. Promising solutions are selected for further test and evaluation and, if successful, rapid prototyping or fielding to transition commercial ideas with military utility. These efforts support the Department's objectives of leveraging commercial innovation to maintain technology superiority; increasing rate of technology maturation; exploring alternative and faster pathways for acquisition; and, fielding affordable and effective capabilities. In FY 2019, Prototyping Through Non-Traditional Pathways conducted reviews focused on priorities of USSOCOM, Joint Improvised-Threat Defeat Organization, cyber community of interest, and Office of the Under Secretary of Defense, Research and Engineering.<br><br>***FY 2020 Plans:***<br>Prototyping Through Non-Traditional Pathways anticipates three to five reviews in FY 2020, and 15 to 20 resulting evaluations with potential for future prototypes. Each review focuses on identifying ideas in a specific topic area that can transition to meet joint operational needs through rapid prototyping. These reviews will be executed with DoD users and interagency partners such | 3.000 | 3.000 | - |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603826D8Z / *Quick Reaction Special Projects (QRSP)* | **Project (Number/Name)**<br>828 / *Rapid Reaction Fund* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| as Service program offices, the Joint Artificial Intelligence Center, Defense Threat Reduction Agency, and the Office of the Under Secretary of Defense, Research and Engineering.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>In FY 2021, the portfolio will transition to PE 0603338D8Z Defense Modernization and Prototyping to increase coordination and streamline transition of promising capabilities. | | | |
| ***Title:*** Disparate Data Fusion, Analysis, and Applications for Networked Systems Focus Area<br>***Description:*** Disparate Data Fusion, Analysis, and Applications for Networked Systems develops prototypes to validate new approaches for managing and capitalizing on the increase of data volume, variety, variability, and velocity from our networked communications and sensors. Growth in social media, big data analytics, and large dynamic sensor networks require new tools for aggregation, processing, exploitation, and dissemination. Projects include the development of capabilities, software, and tools to fuse, analyze, and infer information from a wide variety of structured or unstructured datasets from a broad spectrum of sources. Where possible these projects will exploit advanced machine learning systems and commercial technologies to provide solutions to emerging challenges in tracking targets, big data analytics, and extracting indications and warnings. Technologies developed within this focus area will reduce cost and analyst requirements to provide meaningful intelligence in support of areas such as counter-weapons of mass destruction, gray-zone near-peer competition, human terrain mapping applications, and operations in denied areas.<br>***FY 2020 Plans:***<br>RRF investment decisions are made during the execution year in response to DoD, CCMD, Service, and other government priorities and as new threats emerge or new opportunities are presented. RRF supports development of prototypes and new disparate data fusion, analysis tools, and applications to provide a hedge against emerging, irregular, and asymmetric threats. The program anticipates supporting six to eight projects in FY 2020. Deliverables will leverage emerging technologies to exploit wide variety of information sources and reduce analyst requirements to provide actionable intelligence.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>In FY 2021, the portfolio will transition to PE 0603338D8Z Defense Modernization and Prototyping to increase coordination and streamline transition of promising capabilities. | - | 6.045 | - |
| ***Title:*** Autonomous Learning Systems and Behaviors Focus Area<br>***Description:*** Autonomous Learning Systems and Behaviors prototypes demonstrate capabilities to enhance the lethality of the joint force, reduce the time to make critical decisions, and protect warfighters through increased use of autonomous and human-machine collaborative systems. Selected projects leverage advances in machine learning to transfer cognitive burden closer to the point of collection and action. Example projects include agile computer vision systems; enhanced capabilities for | - | 5.488 | - |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603826D8Z / *Quick Reaction Special Projects (QRSP)* | **Project (Number/Name)**<br>828 / *Rapid Reaction Fund* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| multiple autonomous systems to cooperatively interact; autonomous task discrimination and prioritization; autonomous operation in complex terrain; optimization of autonomous supply delivery in contested environments; data preprocessing to improve ex-filtration from unmanned sensors; human-machine collaborative decision making; and, experiments to counter emerging unmanned threats from potential adversaries. These projects will also examine common software platforms and modular open architecture systems to reduce development cost, increase collaboration among manned and unmanned vehicles, increase agility through rapid customization, and inform requirements.<br><br>***FY 2020 Plans:***<br>RRF investment decisions for Autonomous Learning Systems and Behaviors are made during the execution year in response to DoD, CCMD, Service, and other government priorities. Selected projects will support development of components, payloads, and autonomous aerial, surface, and subsurface systems. RRF anticipates supporting six to seven projects in FY 2020.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>In FY 2021, the portfolio will transition to PE 0603338D8Z Defense Modernization and Prototyping to increase coordination and streamline transition of promising capabilities. | | | |
| ***Title:*** Enhanced Lethality in the Contested Urban Environment Focus Areas<br><br>***Description:*** Future military operations will likely occur in a broad range of urban environments with complex radio frequency, topological complications, diminished situational awareness, and mobility challenges. Enhanced Lethality in the Contested Urban Environment Focus Area prototypes will identify, analyze, and describe typical urban areas for modeling, simulation, and planning purposes. These efforts will inform and enable development of intelligence, surveillance, and reconnaissance; electronic warfare; kinetic and non-kinetic effects; and, other capabilities needed for future military operations in a wide range of urban areas.<br><br>***FY 2020 Plans:***<br>RRF investment decisions for Enhanced Lethality in the Contested Urban Environment projects are made during the execution year in response to DoD, CCMD, Service, and other government priorities. As new threats emerge and new opportunities are presented, RRF will select projects to demonstrate capabilities for Urban Characterization. RRF anticipates supporting four to five projects in FY 2020. Deliverables will include conceptual prototypes, modeling, and simulations to support planning efforts.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>In FY 2021, the portfolio will transition to PE 0603338D8Z Defense Modernization and Prototyping to increase coordination and streamline transition of promising capabilities. | - | 4.154 | - |
| ***Title:*** Rapid Prototyping for Systems and Applications of Interconnected Sensors and Command Networks Focus Area<br><br>***Description:*** Intelligence, surveillance, and reconnaissance (ISR) sensor networks are critical for providing asymmetric advantage against larger, near-peer adversaries. Advances in distributed, interconnected sensors with fully networked | - | 5.502 | - |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603826D8Z / *Quick Reaction Special Projects (QRSP)* | **Project (Number/Name)**<br>828 / *Rapid Reaction Fund* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| command, control, and communications provide opportunities for new solutions to anti-access/area denial and persistent surveillance challenges. Efforts in this focus area will increase the speed of innovation and technology adoption for dynamic, inhomogeneous, fully networked sensors, and develop new tools to more effectively analyze or visualize ISR data. Projects include improved sensor hardware; new capabilities enabled by networked sensor systems; sensor network protection and assured communications; validation of low-cost, robust persistent surveillance capabilities; and, establishment of more effective processing, exploitation, and dissemination capabilities. RRF sponsored prototypes will facilitate integration of advanced ISR and communication capabilities into new and existing systems. These prototypes will help increase the effectiveness of ISR architectures and reduce the human analyst requirement to produce actionable intelligence.<br><br>***FY 2020 Plans:***<br>RRF investment decisions for sensor network prototypes are made during the execution year in response to DoD, CCMD, Service, and other government priorities and as new threats emerge or new opportunities are presented. Research and coordination with organizations throughout DoD and other government agencies will help identify areas critical to developing future capabilities. RRF anticipates supporting five to seven projects in FY 2020. Deliverables will include prototype systems, analytical capabilities, and software for a variety of platforms.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>In FY 2021, the portfolio will transition to PE 0603338D8Z Defense Modernization and Prototyping to increase coordination and streamline transition of promising capabilities. | | | |
| ***Title:*** Novel Manufacturing Focus Area | - | 2.733 | - |
| ***Description:*** This focus area will develop enabling capabilities and key prototypes required to advance and secure new manufacturing technologies including additive manufacturing, emerging microelectromechanical systems (MEMS), and tailored integrated circuit architectures to meet specific warfighter needs. New manufacturing technologies are enabling revolutionary advances in existing capabilities such as hand held deoxyribonucleic acid (DNA) sequencing; advanced wearable devices; tailored metamaterials; advanced MEMS radio frequency circuits; and, integrated photonic devices. Many novel manufacturing processes allow for rapid prototyping and iterative innovation, removing barriers for technology insertion. These manufacturing technologies provide a unique capability for maintaining a U.S. competitive advantage through order of magnitude size, weight, and power reductions; increased speed from design to prototype; reduced cost; and, reduced waste. This focus area will leverage swiftly-developing commercial innovation and emerging capabilities of the Federally Funded Research and Development Centers, government laboratories, and academia to develop conceptual prototypes focused on warfighter needs. Projects will also investigate security of additive manufacturing technologies, digital schematics, MEMS devices, and custom integrated circuit architectures. Deliverables inform enhancement decisions and concept of operations development.<br><br>***FY 2020 Plans:*** | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
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| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603826D8Z / *Quick Reaction Special Projects (QRSP)* | **Project (Number/Name)**<br>828 / *Rapid Reaction Fund* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| RRF investment decisions are made during the execution year in response to DoD, CCMD, Service, and other government priorities and as new threats emerge or new opportunities are presented. For novel manufacturing projects, this agility supports leveraging new capabilities developed by commercial industry. Research and coordination with organizations throughout DoD and other government agencies will help identify needs that could be addressed by future capabilities within the additive manufacturing field. RRF anticipates supporting five to seven projects in FY 2020.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>In FY 2021, the portfolio will transition to PE 0603338D8Z Defense Modernization and Prototyping to increase coordination and streamline transition of promising capabilities. | | | |
| ***Title:*** Prototyping Through Novel Reuse of Government/Commercial-Off-the–Shelf (G/COTS) Technologies Focus Area<br>***Description:*** This effort increases impact and responsiveness of prototyping efforts through the reuse and repurposing of existing commercial and governmental technologies. Frequently, systems developed for a separate application provide a partial solution to new emerging challenges. By building new prototypes around a core of proven technologies, this effort reduces development and adoption risk in addition to controlling cost. This focus area provides RRF with agility by leveraging existing technologies to develop new prototypes and demonstrate new capabilities more quickly.<br>***FY 2020 Plans:***<br>RRF investment decisions for G/COTS-based prototypes are made during the execution year in response to DoD, CCMD, Service, and other government organization priorities and as new threats emerge or new opportunities are presented. Projects identified include efforts to repurpose commercial communication protocols into an electronic warfare capability; novel techniques for efficient distribution of logistics; advances in microelectronic circuits; advances in quantum sensors and programming for quantum processers; and, commercial network security platforms. RRF anticipates supporting three to four projects in FY 2020.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>In FY 2021, the portfolio will transition to PE 0603338D8Z Defense Modernization and Prototyping to increase coordination and streamline transition of promising capabilities. | - | 2.874 | - |
| ***Title:*** Joint Rapid Acquisition Cell (JRAC) Management Support<br>***Description:*** This funding is used to support the staff manning of the JRAC to enable management and tracking of CCMD identified and Joint Staff validated immediate warfighter needs. The funding enables management and tracking of Combatant Command (CCMD) identified and Joint Staff validated immediate warfighter needs. The JRAC is responsible to:<br>(1) Coordinate review of validated Joint Urgent Operational Needs (JUON) and Joint Emergent Operational Needs (JEON) and assign responsibility to appropriate DoD Components for timely funding and resolution. | 1.669 | - | - |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603826D8Z / *Quick Reaction Special Projects (QRSP)* | **Project (Number/Name)**<br>828 / *Rapid Reaction Fund* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| (2) Serve as the review and approval authority for the DoD Components' strategy to fund and mitigate the identified JUON/JEON capability gaps.<br>(3) Continually assess actions taken by the DoD Components to resolve JUONs/JEONs and recommend to the Under Secretary of Defense for any changes determined appropriate to improve their responsiveness to JUONs/JEONs.<br>(4) Provide periodic reports to the Secretary of Defense on new and outstanding JUONs/JEONs.<br>(5) In coordination with Under Secretary of Defense Comptroller (USD(C)), manage the Rapid Acquisition Fund (RAF) to allocate resources to priority unfunded JUONs/JEONs.<br>(6) In coordination with the Office of the Chairman of the Joint Chiefs of Staff and the USD(C), make programmatic, budget, and acquisition recommendations for JUONs and identify capability gaps to the Secretary of Defense. | | | |
| **Accomplishments/Planned Programs Subtotals** | 36.182 | 33.296 | - |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

RRF leverages the Services' and Defense Agencies' most efficient and effective acquisition approach for rapid prototyping. This includes using Other Transaction Authorities and new or existing contract vehicles.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 3 | R-1 Program Element (Number/Name)<br>PE 0603826D8Z / *Quick Reaction Special Projects (QRSP)* | Project (Number/Name)<br>833 / *Strategic Multi-Layered Assessment (SMA) Support* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 833: *Strategic Multi-Layered Assessment (SMA) Support* | 13.005 | 2.323 | 2.351 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

In FY 2021, the Strategic Multi-Layered Assessment (SMA) Support will transition to PE 0603338D8Z Defense Modernization and Prototyping. The transition of SMA will enable continued support to senior Combatant Command (CCMD) leadership and Joint Force Commanders while ensuring that funding resources are properly allocated to meet rapidly evolving and emergent threats.

The mission of SMA is to provide traditional and non-traditional planning and decision support to CCMDs and other U.S. Government departments and agencies on a case-by-case basis. SMA products are designed to expand the Commanders' operational and strategic horizons and choices when facing complex environments by introducing the power of cognitive diversity from Subject Matter Experts (SMEs) and researchers employing varied paradigms and methodologies. SMA frames options, but does not make specific policy or strategy recommendations. SMA receives formal requests for support from the CCMDs at the senior Flag Officer level. These requests are reviewed by Joint Staff J-39 Deputy Director for Global Operations (DDGO) and USD(R&E) for validation based on the following criteria: (1) The problem requires multi-agency, multi-disciplinary approaches; and (2) Expertise required for the assessment does not lie within the core competencies of a single command or agency but instead, requires the collective inputs from across the U.S. Government, academia, policy centers, and the private sector. SMA is also supported by the Rapid Reaction Fund (RRF).

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Strategic Multi-Layered Assessment (SMA) | 2.323 | 2.351 | - |
| ***Description:*** The SMA Cell supports the CCMDs and U.S. government agencies with actionable assessments of complex operational and technical challenges, to help maintain our competitive advantage in an increasingly complex global environment. Challenges addressed with SMA efforts require multi-agency and multi-disciplinary approaches that are not within the customer organization's core competency. SMA started a strategic analysis effort at the request of the U.S. Security Coordinator for Israel and the Palestinian Authority. The effort evaluated strategic risks and identified knowledge gaps to provide an increased understanding of potential security environments and their implications for Palestinian security sector reform. U.S. European Command (USEUCOM) subsequently asked SMA to apply the same methodology to identify emerging Russian threats and opportunities in Eurasia. SMA efforts are facilitated by the Joint Chiefs of Staff/J-3 Operations and are executed by the Office of the Under Secretary of Defense, Research and Engineering. | | | |
| ***FY 2020 Plans:***<br>SMA will actively work with the CCMDs and the Joint Chiefs of Staff to identify challenging problems within the scope described above. These problems will be in direct support of CCMD senior leadership and may include areas such as: counter terrorism; transnational criminal organizations; counter weapons of mass destruction (state and non-state); counter global or regional social | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603826D8Z / *Quick Reaction Special Projects (QRSP)* | **Project (Number/Name)**<br>833 / *Strategic Multi-Layered Assessment (SMA) Support* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| and cultural assessments; regional stability assessments; and, individual state or national level deterrence studies. Specifically for FY 2020, SMA will conduct an assessment entitled "Competition & Conflict Dynamics Incubator in the Eurasian Landmass." SMA proposes to establish a testbed (or incubator) to study changing regional dynamics amidst increasing great power competition. These include anticipated trajectories of state and non-state factors inherent to the region of concern as well as potential black swan scenarios that could greatly alter the balances of both hard and soft power in the Central Region in ways detrimental to key U.S. interests.<br><br>To accomplish this effort, SMA will leverage a highly effective and expansive virtual network of globally placed SMEs using relationships with numerous agencies and organizations, including Military Departments/Services, DoD analysis centers, other U.S. Government departments and agencies, the private sector, academia, and partner nation governments. Structured interviews, literature reviews, original research, modeling and simulation, and gaming are all ways that SMA gathers input for their products. The input is then curated and goes through several rounds of coordination that includes a Senior Review Group (SRG) before completion.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>In FY 2021, the SMA will transition to PE 0603338D8Z Defense Modernization and Prototyping. The realignment of SMA will not change the objective of providing support to the CCMDs or influencing acquisition programs resulting from identified needs. | | | |
| **Accomplishments/Planned Programs Subtotals** | 2.323 | 2.351 | - |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603833D8Z / *Engineering Science and Technology (S&T)* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 64.549 | 18.895 | 19.376 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| 401: *DoD Modeling and Simulation Management Office* | 18.565 | 4.608 | 4.701 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| 402: *Systems Engineering Research Center* | 13.311 | 4.905 | 4.900 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| 403: *Engineered Resilient Systems* | 32.673 | 9.382 | 9.775 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

**Note**

The reductions to Engineering Science and Technology reflect a decrement from the Defense Wide Review, a realignment of resources into the Systems Engineering (SE) Program Element (0605142D8Z) to support enhanced engineering expertise and assessments for mission-oriented prototypes focused on modernization priorities, and a reduction for other DoD priorities.

**A. Mission Description and Budget Item Justification**

This Program Element (PE) advances engineering state of the practice, and complex defense systems challenges through development of engineering capabilities to improve acquisition quality. Engineering science and technology, including systems engineering (SE) research, supports the cost-effective acquisition of complex systems.

This PE increases lethality and supports Department business reform (National Defense Strategy Lines of Effort 1 and 3 respectively). Improvements to the Department's systems engineering capabilities ensure we quickly and affordably field a lethal Joint Force by addressing dependencies in system and mission capabilities, rapidly evolving technologies, lifecycle considerations, and resource limitations in the face of dynamic threats and missions.

In FY 2021, DoD Modeling and Simulation Management Office (MSMO) funding Modeling and Simulation (M&S) activities will transition to Systems Engineering (Program Element 0605142D8Z).

The Systems Engineering Research Center (SERC) is a University Affiliated Research Center (UARC) established in 2008 as a strategic resource to conduct systems research and improve the Department’s ability to develop and deploy complex weapon systems. The SERC consists of a network of 22 research universities from across the U.S. working collaboratively to bring the best academic talent in the nation to bear on DoD’s systems engineering research problems. During FY 2021, SERC funding will be reduced to realign activities to the Department’s modernization priorities. The SERC will complete R&E funded projects started in prior fiscal years and R&E will establish a business model to sustain the SERC’s network of universities for utilization by other DoD components. In addition, following the realignment of FY 2021 resources, approximately $2.000 million of Systems Engineering (0605142D8Z) resources will be used to sustain SERC operations for continued support of Service funded projects.

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603833D8Z / *Engineering Science and Technology (S&T)* |

The Engineered Resilient Systems (ERS) project reduces the risk in development of future weapon systems and ensures warfighter success through better-informed acquisition decisions. ERS integrates high-fidelity, physics-based modeling with advanced analytic tools to enable rapid design and analysis of current and future weapon systems. Through the use of high-performance computing, optimized computational tools, and improved processes and methods, ERS enables faster evaluation of system performance, systems-of-systems analysis, and system evaluation within operationally relevant environments to complement and reduce costly physical testing. In order to focus ERS efforts on the Department's modernization priorities, ERS project funding will transition in FY 2021 to Systems Engineering (Program Element 0605142D8Z). With further ERS advances from a development project to an enduring support capability, this shift will better align with the purpose of research funded by projects associated with Systems Engineering. This change directly orients the previously developed capabilities to address modernization efforts driven by the National Defense Strategy.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 19.371 | 19.376 | 19.511 | - | 19.511 |
| Current President's Budget | 18.895 | 19.376 | 0.000 | - | 0.000 |
| Total Adjustments | -0.476 | 0.000 | -19.511 | - | -19.511 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | -0.473 | - | | | |
| • Realignment of Engineering Resources | - | - | -11.628 | - | -11.628 |
| • Reduction for Defense Wide Review | - | - | -4.883 | - | -4.883 |
| • Economic Assumption | - | - | -0.007 | - | -0.007 |
| • Adjustment to support other DoD priorities | - | - | -2.993 | - | -2.993 |
| • Other Adjustments | -0.003 | - | - | - | - |

**Change Summary Explanation**

Defense-Wide Review: The FY 2021 funding request was reduced by $4.883 million during DWR to realign funds for higher priority DoD missions.

FY 2021 also included a realignment of $11.628 million to Systems Engineering (Program Element 0605142D8Z) to support enhanced engineering expertise and assessments for mission-oriented prototypes that address modernization priorities, a $2.993 million reduction to support other DoD priorities, and a $0.007 million reduction for economic assumptions.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 3 | R-1 Program Element (Number/Name)<br>PE 0603833D8Z / *Engineering Science and Technology (S&T)* | Project (Number/Name)<br>401 / *DoD Modeling and Simulation Management Office* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 401: *DoD Modeling and Simulation Management Office* | 18.565 | 4.608 | 4.701 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

**Note**

In FY 2021, DoD Modeling and Simulation Management Office transitions to Systems Engineering (Program Element 0605142D8Z).

**A. Mission Description and Budget Item Justification**

The Office of the Under Secretary of Defense for Research and Engineering (OUSD(R&E)) designated the DoD Modeling and Simulation Management Office (MSMO) to be the focal point and advocate for Defense M&S to enhance the Defense modeling and simulation (M&S) Enterprise by (1) enabling cooperation and collaboration in identifying, developing and sustaining modeling and simulation solutions; and (2) promoting technology solutions, including common M&S architectures, standards, and services that improve interoperability, reuse, and cost effectiveness of DoD M&S.

MSMO is responsible for:
• Planning, coordinating, and managing funds to support enterprise-level joint and cross-cutting M&S activities that guide the Defense M&S Community to achieve the DoD Strategic Vision for M&S.
• Bringing together M&S stakeholders to advise and assist on finding solutions for removing the barriers to interoperability, reuse, commonality, efficiency, and effectiveness.
• Developing, coordinating, and advocating for policy/guidance, technology, standards, best practices, and strategic planning processes that promote interoperability and reuse across the Department.

MSMO also serves as DoD's:
• Focal point and advocate for coordinating M&S information exchanges and interactions within DoD, with other U.S. Government departments and agencies, international allies, industry, and academia to promote sharing of information and practices, synergy of efforts, and M&S as a key enabler of all organizations' missions.
• Lead Standardization Activity (LSA) for managing M&S standards and methodologies.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** DoD Modeling and Simulation Management Office (MSMO) | 4.608 | 4.701 | 0.000 |
| ***Description:*** MSMO, as the OUSD(R&E)-designated focal point for Defense modeling and simulation (M&S), is responsible for maintaining and enhancing policies, standards, technology, and collaboration to ensure the efficiency and effectiveness of the M&S that supports the full range and scope of DoD missions and operations. | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603833D8Z / *Engineering Science and Technology (S&T)* | **Project (Number/Name)**<br>401 / *DoD Modeling and Simulation Management Office* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Funding for MSMO in this Program Element will go to zero in FY 2021. FY 2020 will be used to transition the MSMO capabilities into the general body of systems engineering policy and practice as well as focus on other research and engineering priorities.<br><br>***FY 2020 Plans:***<br>Policy and Guidance:<br>• Update M&S guidance as needed for the Defense Acquisition Guidebook and Verification, Validation, and Accreditation Recommended Practice Guide.<br><br>Standards:<br>• Serve as the Lead Standardization Activity for M&S Standards and Methodologies, and/or lead and participate in Defense Standardization Program Office and Joint Enterprise Standards Committee activities and International standards activities such as NATO Standardization Agreements for M&S.<br>• Enhance the Defense M&S Reference Architecture with additional patterns identified through user feedback.<br>• Transition and align M&S standards activities to USD(R&E) digital, mission and systems engineering activities or other organizations, as needed.<br><br>Technology:<br>• Transition the M&S enterprise suite of tools used to improve joint and cross-cutting M&S capabilities to USD(R&E) digital, mission, and systems engineering activities or other Defense partners, as needed.<br>• Chair M&S Community of Interest and other M&S related working groups with a focus on the OUSD(R&E) priorities; provide Assistant Directors with M&S data and recommendations on Department capabilities relative to their priority.<br><br>Collaboration:<br>• Work with Defense stakeholders and continue to refine Department-wide M&S gaps monitoring and reduction capability.<br>• Work with USSOCOM and Simulator Interoperability Senior Steering Group to execute implementation of the OUSD(R&E)-signed Decision Memorandum.<br>• Represent U.S. interests in International M&S activities as required.<br>• Collaborate with interagency organizations, as required.<br>***FY 2021 Plans:***<br>The DoD Modeling and Simulation Management Office will transition to Systems Engineering (Program Element 0605142D8Z) in FY 2021.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:*** | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603833D8Z / *Engineering Science and Technology (S&T)* | **Project (Number/Name)**<br>401 / *DoD Modeling and Simulation Management Office* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| In FY 2021, funding for DoD Modeling and Simulation Management Office is reduced and the effort transitions to Systems Engineering (Program Element 0605142D8Z). | | | |
| **Accomplishments/Planned Programs Subtotals** | 4.608 | 4.701 | 0.000 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

N/A

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 3 | R-1 Program Element (Number/Name)<br>PE 0603833D8Z / *Engineering Science and Technology (S&T)* | Project (Number/Name)<br>402 / *Systems Engineering Research Center* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 402: *Systems Engineering Research Center* | 13.311 | 4.905 | 4.900 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

**Note**

In FY 2021, funding for the Systems Engineering Research Center is reduced and realigned to Systems Engineering (Program Element 0605142D8Z) to support Integration, Technology, and Tools.

**A. Mission Description and Budget Item Justification**

The Systems Engineering Research Center (SERC) is a University Affiliated Research Center (UARC) established in 2008 as a strategic resource to conduct systems research and improve the Department's ability to develop and deploy complex weapon systems.

The SERC's network of universities is led by the Stevens Institute of Technology, and includes the Air Force Institute of Technology, Auburn University, Carnegie Mellon University, Georgetown University, Georgia Institute of Technology, Massachusetts Institute of Technology, Missouri University of Science and Technology, Naval Postgraduate School, North Carolina Agricultural and Technical State University, Old Dominion University, Pennsylvania State University, Purdue University, Texas A&M University, University of Alabama, University of Maryland, University of Massachusetts, University of South Florida, University of Southern California, University of Virginia, Virginia Polytechnic Institute, and Wayne State University. These universities work collaboratively to bring the best talent in the nation to bear on DoD's systems engineering research problems.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Systems Engineering Research Center | 4.905 | 4.900 | - |
| ***Description:*** The SERC is a DoD UARC which conducts University-based research that directly supports DoD's National Defense Strategy through development of new systems engineering methods, processes, and tools.<br><br>***FY 2020 Plans:***<br>In FY 2020, the SERC will continue to enhance engineering methods, processes and tools by conducting research aligned with the National Defense Strategy, in order to improve mission capabilities in the following areas:<br><br>• Systems Engineering Transformation: transform current systems engineering methods to enable rapid, concurrent and scalable definition and affordable development of flexible systems that are responsive to changing threats and missions;<br>- Develop and apply trade-space analysis methods to balance dynamic requirements and emerging technologies to improve mission success.<br><br>• Enterprises and Systems of Systems: create foundational methods to develop and design enterprises and system of | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603833D8Z / *Engineering Science and Technology (S&T)* | **Project (Number/Name)**<br>402 / *Systems Engineering Research Center* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| systems to provide an overwhelming competitive advantage over our adversaries;<br>– Develop and apply enterprise model to measure factors impacting use digital engineering methods to acquire DoD's weapon systems, and gauge the resulting mission benefits.<br><br>• Trusted Systems: secure defense systems from cyber and other threats through systemic security and assurance approaches that complement incomplete current perimeter/network defense methods;<br>– Develop risk-based algorithms and tools for static analysis of software, integrating attack databases and well-known vulnerabilities to prioritize mitigation activities.<br><br>• Human Capital Development: speed the professional development of highly capable systems engineers and technical leaders in the Department and the Defense Industrial Base.<br>– Develop systems engineering competencies in undergraduate engineers though capstone design projects that provide novel solutions to warfighter problems.<br><br>Together, these new methods will accelerate the delivery of critical mission capabilities and technologies, such as autonomy and machine learning, in the face of a dynamic cyber adversary.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The level of effort decreases between FY 2020 and FY 2021 to align application of systems engineering methods, processes, and tools for Mission Engineering, Systems Engineering and National Defense Strategy modernization areas. | | | |
| **Accomplishments/Planned Programs Subtotals** | 4.905 | 4.900 | - |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | | | | | | | | | Date: February 2020 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 3 | | | | | R-1 Program Element (Number/Name)<br>PE 0603833D8Z / *Engineering Science and Technology (S&T)* | | | | Project (Number/Name)<br>403 / *Engineered Resilient Systems* | | | |
| **COST ($ in Millions)** | **Prior Years** | **FY 2019** | **FY 2020** | **FY 2021 Base** | **FY 2021 OCO** | **FY 2021 Total** | **FY 2022** | **FY 2023** | **FY 2024** | **FY 2025** | **Cost To Complete** | **Total Cost** |
| 403: *Engineered Resilient Systems* | 32.673 | 9.382 | 9.775 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

**Note**

Engineered Resilient Systems (ERS) funding and mission realigns to Systems Engineering (Program Element 0605142D8Z) in FY 2021 to support enhanced engineering expertise and assessments for mission-oriented prototypes that address modernization priorities.

**A. Mission Description and Budget Item Justification**

ERS integrates high-fidelity, physics-based modeling with advanced analytic tools to enable rapid design and analysis of current and future weapon systems. Through the use of high-performance computing, optimized computational tools, and improved processes and methods, ERS enables faster evaluation of system performance, systems-of-systems analysis, and system evaluation within operationally relevant environments to complement and reduce costly physical testing. ERS project funding will transition in FY 2021 to Systems Engineering (Program Element 0605142D8Z), with further ERS research funded by projects associated with the modernization priorities. This change directly orients the previously developed capabilities to address modernization efforts driven by the National Defense Strategy.

ERS products are engineering design visualization and tool integration frameworks that integrate physics-based models and engineering tools to greatly improve the ability to perform tradespace and requirements analysis, optimize designs, and evaluate system performance.

ERS leverages multi-fidelity physics-based models developed by the S&T community to inform the acquisition decision process, e.g., increased/easier use of high-performance computing, analyses of massive data sets, and lifecycle cost sensitivity analysis.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Engineered Resilient Systems (ERS) | 9.382 | 9.775 | 0.000 |
| ***Description:*** The ERS project directly supports the DoD modernization priorities by delivering computational engineering tools for performance analysis, modeling and simulation, tradespace assessment, and data analysis and visualization. These engineering tools support in-depth analyses that validate new technology solutions during critical acquisition engineering activities prior to major acquisition milestones. | | | |
| ***FY 2020 Plans:***<br>During FY 2020, ERS research will focus on reducing the decision risk associated with hypersonic and directed energy weapon systems. ERS will also continue efforts to enable the use of artificial intelligence for design and analysis of future weapon platforms. Further, ERS will work to transition from Engineering S&T funded activities to requirements directly funded by DoD's modernization priorities. | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603833D8Z / *Engineering Science and Technology (S&T)* | **Project (Number/Name)**<br>403 / *Engineered Resilient Systems* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Specifically, ERS will advance research in the following areas:<br><br>• Automated Engineering Processes: develop and deliver a decision-support environment that enables set-based design, optimization, tradespace analysis, and visualization of data from DoD platforms; and incorporate techniques to increase reuse of data, models, software tools, and analyses, e.g., developing methods and tools for multi-domain analysis of hypersonics vehicles.<br><br>• Integrated High-Fidelity Simulations: develop and evolve computational tools to support parametric design environments; use high-performance computing to speed analyses; and integrate multiple disciplines into ERS workflows such as high-fidelity fluid dynamics, structural mechanics, and/or other performance determination models.<br><br>• High-Performance Data Analytics: evolve data engineering techniques to improve storage, labeling, and analysis of vast operational datasets from existing weapon systems; demonstrate machine learning methods to gain insight from weapon system data; and explore the use of artificial intelligence and machine learning techniques to assist humans in the design of new weapon systems.<br>***FY 2021 Plans:***<br>ERS transitions in FY 2021 to Systems Engineering (Program Element 0605142D8Z).<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>ERS transitions in FY 2021 to Systems Engineering (Program Element 0605142D8Z). | | | |
| **Accomplishments/Planned Programs Subtotals** | 9.382 | 9.775 | 0.000 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

N/A

**D. Acquisition Strategy**

N/A

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603924D8Z *I High Energy Laser Advanced Development* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 0.000 | 71.819 | 80.723 | 105.410 | - | 105.410 | 108.663 | 108.484 | 110.634 | 112.376 | Continuing | Continuing |
| 924: *High Energy Laser Initiative* | 0.000 | 71.819 | 80.723 | 105.410 | - | 105.410 | 108.663 | 108.484 | 110.634 | 112.376 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

This program element funds High Energy Laser (HEL) advanced technology development aimed at translating technology solutions for broadly defined military problems into demonstrated performance pay-offs, increased capabilities, increased supportability, and/or increased affordability. HEL weapons systems have many potential advantages, including speed-of-light time-to-target, high precision, nearly unlimited magazine depth, low cost per kill, and reduced logistics requirements because of no need for stocks of munitions or warheads. As a result, HELs have the potential to perform a wide variety of military missions. Activities conducted under this program element will develop and demonstrate the technology necessary to enable HEL missions across the Department of Defense (DoD).

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 74.364 | 85.223 | 81.152 | - | 81.152 |
| Current President's Budget | 71.819 | 80.723 | 105.410 | - | 105.410 |
| Total Adjustments | -2.545 | -4.500 | 24.258 | - | 24.258 |
| • Congressional General Reductions | - | -4.500 | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | -2.532 | - | | | |
| • Other Adjustments | -0.013 | - | -0.663 | - | -0.663 |
| • Increase for Laser Scaling | - | - | 25.000 | - | 25.000 |
| • Economic Assumption | - | - | -0.079 | - | -0.079 |

**Change Summary Explanation**

The increase in FY 2021 will enable investigation of a fourth laser scaling approach as well as the creation of an integrated and validated database of operational laser lethality effects.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 3 | R-1 Program Element (Number/Name)<br>PE 0603924D8Z / *High Energy Laser Advanced Development* | Project (Number/Name)<br>924 / *High Energy Laser Initiative* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 924: *High Energy Laser Initiative* | 0.000 | 71.819 | 80.723 | 105.410 | - | 105.410 | 108.663 | 108.484 | 110.634 | 112.376 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

This program element is part of an overall Defense strategy in High Energy Laser (HEL) science and technology development focused on scaling the output power of HELs to reach operationally effective power levels applicable to broad mission areas across the DoD. Efforts will also pursue improvements in common HEL system components such as efficient power and/or thermal management approaches, effective power supplies, and beam combining/beam director designs. This program element complements, and will be closely coordinated with, other DoD HEL efforts directed at specific Service and Agency missions.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** High Energy Laser Power Scaling | 71.819 | 80.723 | 105.410 |

***Description:*** This effort is focused on scaling the capabilities of high energy laser (HEL) weapons up to the level needed for multi-Service missions, both tactical and strategic, such as (but not limited to) integrated air and missile defense against hard targets. It leverages and/or builds upon other investments in HEL development, such as laser scaling and propagation and beam control.

***FY 2020 Plans:***

- Laser Scaling: Continue the base effort of scaling HELs to the 300 kW-class power level. First, the overall the overall system architecture for each candidate HEL will be designed and tested. Second, the high risk elements of each architecture, such as the fiber laser modules, the spectral beam combining fiber arrays, and the grating will be tested to ensure they satisfy system requirements. An additional novel approach to 300 kW laser scaling will be initiated.
- Propagation and Beam Control: Nonlinear atmospheric propagation effects such as thermal blooming will be modeled and simulated. Experimental data on HEL atmospheric propagation will be collected. The experimental data will be compared to the modeling and simulation results.
- High Energy Laser lethality: Collect additional data on laser damage effects experimentation from the services, including modeling and simulation results. Once this data is collected, it will be organized into to a unified database which can be accessed by the operational HEL laser community for integrated air and missile defense (IAMD) mission planning, including transferring the results into a Directed Energy Joint Munition Effectiveness Manual for those missions.

***FY 2021 Plans:***

- Laser Scaling: Designs for 300 kW class HELs will be finalized and the system elements will be integrated into prototype 300 kW lasers. Architectures will be developed for laser scaling from 300 kW to achieve 500 kW.
- Propagation and Beam Control: Continue research on thermal blooming of 300-500 kW class lasers, including data collection, modeling and simulation, and scaled field experiments.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
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| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603924D8Z / *High Energy Laser Advanced Development* | **Project (Number/Name)**<br>924 / *High Energy Laser Initiative* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| - High Energy Laser lethality: Collect additional data on laser damage effects experimentation from the services, including modeling and simulation results. Once this data is collected, it will be integrated into the unified database developed in FY 2020.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Increase funding in FY 2021 will enable investigation of a fourth laser scaling approach as well as the creation of an integrated and validated database of operational laser lethality effects. | | | |
| **Accomplishments/Planned Programs Subtotals** | 71.819 | 80.723 | 105.410 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

N/A

**D. Acquisition Strategy**

N/A

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
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| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603941D8Z / *Test and Evaluation/Science and Technology* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 628.934 | 114.559 | 191.574 | 187.065 | - | 187.065 | 139.577 | 140.124 | 129.410 | 131.996 | Continuing | Continuing |
| 091: *High Speed Systems Test* | 194.311 | 33.355 | 112.776 | 74.435 | - | 74.435 | 55.665 | 48.438 | 42.736 | 43.590 | Continuing | Continuing |
| 092: *Spectrum Efficient Technology* | 55.894 | 10.682 | 9.340 | 9.725 | - | 9.725 | 9.880 | 10.330 | 10.486 | 10.696 | Continuing | Continuing |
| 093: *Electronic Warfare Test* | 85.364 | 12.478 | 12.808 | 45.980 | - | 45.980 | 15.675 | 20.452 | 14.318 | 14.604 | Continuing | Continuing |
| 094: *Advanced Instrumentation Systems Technology* | 58.970 | 11.517 | 10.583 | 11.034 | - | 11.034 | 11.213 | 11.760 | 12.007 | 12.247 | Continuing | Continuing |
| 095: *Directed Energy Test* | 59.282 | 8.654 | 11.032 | 10.096 | - | 10.096 | 10.572 | 10.932 | 11.057 | 11.278 | Continuing | Continuing |
| 096: *C4I & Software Intensive Systems Test* | 107.237 | 12.381 | 11.297 | 11.977 | - | 11.977 | 12.131 | 12.637 | 12.763 | 13.018 | Continuing | Continuing |
| 097: *Autonomy and Artificial Intelligence Test* | 40.518 | 14.490 | 11.050 | 10.648 | - | 10.648 | 11.090 | 11.641 | 11.873 | 12.110 | Continuing | Continuing |
| 098: *Cyberspace Test* | 27.358 | 11.002 | 12.688 | 13.170 | - | 13.170 | 13.351 | 13.934 | 14.170 | 14.453 | Continuing | Continuing |

**Note**

Starting in FY 2020, Project 097 title will change FROM "Unmanned and Autonomous Systems Test" TO "Autonomy and Artificial Intelligence Test" to more accurately define and describe project workload in terms of the National Defense Strategy and the Under Secretary of Defense (Research and Engineering) prioritization of Artificial Intelligence and machine learning.

**A. Mission Description and Budget Item Justification**

The Test and Evaluation/Science and Technology (T&E/S&T) Program seeks out and develops test technologies to keep pace with evolving weapons technologies. Aligned with the National Defense Strategy, this program is critical to ensure that the Department of Defense (DoD) has the ability to adequately test the advanced systems that will be fielded in the future, building a more lethal force. To meet this objective, the T&E/S&T Program performs the following activities:

- Exploits new technologies and processes to meet important test and evaluation (T&E) requirements.
- Expedites the transition of new technologies from the laboratory environment to the T&E community.
- Leverages industry advances in equipment, modeling and simulation, and networking to support T&E.

Additionally, the T&E/S&T Program examines emerging T&E requirements resulting from Joint Service initiatives to identify T&E technology needs and develop a long-range roadmap for technology insertion. The program leverages and employs applicable applied research efforts from the highly developed technology base in DoD laboratories and test centers, other Government agencies, and industry to accelerate development of new test capabilities. The program outreaches and engages academia to address test technology challenges in DoD testing, advancing Science, Technology, Engineering and Mathematics (STEM) initiatives at Historically Black Colleges and Universities (HBCU) and other minority serving institutions. This program provides travel funds for T&E/S&T program oversight, special studies, analyses,

and strategic planning related to test capabilities and infrastructure. The T&E/S&T Program aligns with the science and technology (S&T) Communities of Interest (COI) to prepare the T&E community to test warfighting capabilities that emerge from priority S&T investments. The T&E/S&T Program is funded within the Advanced Technology Development Budget Activity because it develops and demonstrates high payoff technologies for current and future DoD test capabilities.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 117.389 | 175.574 | 154.520 | - | 154.520 |
| Current President's Budget | 114.559 | 191.574 | 187.065 | - | 187.065 |
| Total Adjustments | -2.830 | 16.000 | 32.545 | - | 32.545 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | 16.000 | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | -2.810 | - | | | |
| • Other Adjustments | -0.020 | - | - | - | - |
| • Economic Assumptions | - | - | -0.155 | - | -0.155 |
| • DoD Increase for 5GAT | - | - | 32.700 | - | 32.700 |

**Change Summary Explanation**

The FY 2020 Congressional add of $16.000 million is for program increase. The FY 2021 base increase of $32.700 million is for testing in support of the Fifth Generation Aerial Target (5GAT).

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 3 | R-1 Program Element (Number/Name)<br>PE 0603941D8Z / *Test and Evaluation/ Science and Technology* | Project (Number/Name)<br>091 / *High Speed Systems Test* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 091: *High Speed Systems Test* | 194.311 | 33.355 | 112.776 | 74.435 | - | 74.435 | 55.665 | 48.438 | 42.736 | 43.590 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

High-speed/hypersonic weapons are being developed to ensure the continued military superiority and strike capability of the United States including freedom of movement and freedom of action in areas protected by anti-access/area denial defenses. Current weapon system demonstrations and technology development programs include high-speed and hypersonic air-breathing missiles, maneuvering reentry and boost-glide weapons, hypersonic gun-launched projectiles, and air-breathing space access vehicles. These systems require development of conventional and high-speed turbine, ramjet, scramjet, and combined cycle engines; high temperature materials; thermal protection systems (TPS); and thermal management systems. The High Speed Systems Test (HSST) project addresses test technology needs including propulsion, aerodynamic and aerothermal testing, so the test community has the technology to support the required test scenarios for concepts under development in the S&T community. The technology developments within the HSST project align with the Department of Defense (DoD) S&T priority investments. As such, the HSST project is developing, validating and transitioning advanced T&E technologies for ground test, open-air range flight test, and advanced computational tools, along with instrumentation and diagnostics systems for use in both ground tests and flight tests of high speed systems.

The HSST project develops technologies to enable robust, accurate, and timely T&E of these future weapon systems. DoD acquisition regulations require weapon systems to undergo a thorough T&E process to detect deficiencies early and to ensure system suitability and survivability. However, the extreme environments in which these weapons operate preclude accurate determination of their performance and operability with today's T&E assets. Current national test capabilities have deficiencies in data accuracy, flight condition replication and simulation, test methods, productivity, modeling and simulation (M&S) fidelity, and range safety.

The HSST mission is to address these national test capability gaps by providing test technology solutions that will enable high-speed and hypersonic weapon systems to be successfully developed through accurate, robust, and efficient T&E.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** High Speed Systems Test | 33.355 | 112.776 | 74.435 |
| ***Description:*** The HSST project continued to advance ground and flight test technologies, techniques, instrumentation, and modeling and simulation capabilities required for the development of high speed air-breathing propulsion and boost-glide weapons. The HSST project continued progress toward addressing the two most significant technology shortfalls in current hypersonic aero propulsion ground test capabilities: clean air heat addition (i.e. non-vitiated air) and variable Mach number test capability. Current production ground test facilities create the high temperature propulsion system inlet conditions necessary for air-breathing scramjet engine testing by burning fuel in the facility airflow supplied to the engine inlet for operation. As demonstrated by a previous HSST test, the resulting vitiated air has different gas properties than clean air found in the atmosphere and thus is not representative of what the vehicle would experience during flight. This significantly affects the engine's performance and operability in the test environment resulting in erroneous flight performance predictions. In addition to the ability to test in clean air, a variable Mach number capability is required to "fly the mission" and determine the critical transient operability effects throughout the flight envelope. Incorporation of component technologies, previously developed by the T&E/S&T | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603941D8Z / *Test and Evaluation/ Science and Technology* | **Project (Number/Name)**<br>091 / *High Speed Systems Test* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| program, were integrated into a small-scale, clean air, true temperature, and variable Mach number aero propulsion test facility, called the Hypersonic Aerothermal and Propulsion Clean Air Testbed (HAPCAT). Completion of this facility will demonstrate that the component technologies and their integration have reached Technology Readiness Level (TRL) 6, provide an on-going test asset to the DoD, and reduce risk for construction of a full-scale facility. The Regenerative Storage Heater (RSH), was demonstrated at flight representative temperatures, allowing non-vitiated air up to Mach 7.5 conditions to be supplied. Final design, fabrication, and installation of the air delivery system (ADS) was completed, which will permit uniform flow into the test cabin with variable pressure and temperature from multiple sources, including the RSH. The facility initiated checkout runs to validate its operation to support DoD weapon systems.<br>The design for a free-jet, variable Mach nozzle (VMN) for use in HAPCAT was continued. Such a capability will permit much more accurate simulation of transient operations along a flight trajectory in a free-jet configuration. The design of the VMN will also serve as a risk-reduction effort for a larger-scale VMN for use in the future full-scale facility.<br>Efforts continued on the installation of a variable Mach number direct-connect nozzle for hypersonic ground test facilities that will provide flight-equivalent Mach numbers between 4 and 6 at true temperatures. The nozzle utilizes a metallic flexible wall to vary the Mach number while withstanding the high temperatures. It will be integrated into the HAPCAT facility upon completion for checkout.<br>The development of a high-pressure tunable-diode laser absorption spectroscopy (TDLAS) continued for eventual integration into HAPCAT to provide accurate air temperature measurements at high temperatures and pressures, which will be used for facility control and determination of facility conditions. The TDLAS system will have uses in other facilities as well for temperature measurements.<br>The arc heater flow quality aerothermal test technology development progressed toward independently-powered spin-coils to control the physical characteristics of the spinning arc column, its attachment location and duration on electrode surfaces within the arc heater. The effort investigated two different spin-coil designs, one of which was validated for use in the mid-pressure arc heater facility. This effort will improve the service life of the electrodes and improve nozzle flow quality.<br>The HSST project continued research that will provide better prediction and determination of boundary layer growth and transition effects upon hypersonic vehicle performance. Understanding and predicting boundary layer transition represents a critical shortfall in the hypersonic community, as it affects the thermal loads, stability and control, and overall performance of a vehicle. Test data from a seven degree cone model were evaluated to assess test techniques and boundary layer transition measurement capabilities between various facilities. Analysis of tests of a boost-glide vehicle were completed in a quiet wind tunnel environment and a traditional, “noisy” wind tunnel environment, providing insight into the effects of flow field disturbances on boundary layer transition continued.<br>Facility flow field characterizations were conducted at the Purdue quiet tunnel and the Large Energy National Shock (LENS) facilities at Calspan University at Buffalo Research Center (CUBRC), enabling more effective comparisons between all the facilities and informing test customers of intrinsic flow features in each facility. The characterizations will also provide insight to | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
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| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603941D8Z / *Test and Evaluation/ Science and Technology* | **Project (Number/Name)**<br>091 / *High Speed Systems Test* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| boundary layer transition studies in these facilities. The HSST project also conducted testing of a boost-glide vehicle, resulting in critical findings to support future flight tests of the vehicle.<br><br>The HSST project continued the design and development of a SkyRange capability to support hypersonic flight testing. This capability aims to provide a more agile, flexible, and cost-effective method for providing support to hypersonic flight tests in the areas of telemetry, atmospheric sensing, optical imaging, flight safety, and other fields to aid in the development of hypersonic vehicles. The capability will reduce the requirement and high-costs of the “string of pearls” collection of air, sea, and land resources used for hypersonic flight tests. Several different technologies within the HSST project will be integrated as part of the SkyRange.<br>Development of an airborne version of the already completed ground LIDAR system continued with the design and testing of hardware components for the in-flight demonstration of the system in preparation for implementation on an un-crewed vehicle. Design for integration of the system on-board an unmanned Global Hawk also continued.<br>Progress continued on a high fidelity automated airborne reconfigurable tracking system which seeks to provide high resolution imaging of hypersonic vehicles in flight. The final design was completed including concepts for integration onto a Global Hawk aircraft. Design for integration of the system on-board an unmanned Global Hawk also continued. This technology will be integrated as part of a SkyRange capability as well.<br>The development and improvement of a telemetry capability integrated with a High Altitude, Long Endurance Un-crewed Aerial System (HALE UAS) for a technical demonstration continued. An iterative development process is ongoing and the latest version of the system was integrated onto a Global Hawk and ground tested. In preparation for long range flight tests, multiple Range Hawks were deployed to Hawaii to exercise CONOPS for multi-aircraft mission support.<br><br>***FY 2020 Plans:***<br>The HSST project will continue developments to improve hypersonic ground and flight test capabilities to levels required for acquisition programs. Development and characterization of the variable-Mach number free-jet nozzle and integration into the HAPCAT facility will continue. Progress will be made in the development of test techniques to determine the combined aerodynamic and aerothermal effects on sensor and seeker performance. Improvements to Thermal Protection System (TPS) test capabilities will be made by developing new test technologies that enable the testing of larger test articles (3x) with more complex geometries for longer test durations. Enhancements to TPS test facilities will also be initiated enabling the simulation of flight trajectories on the ground to better characterize TPS performance in support of hypersonic vehicle design optimization for range, survivability and payload. Development will be initiated to increase the capacity of TPS test facilities to support the increasing demand of hypersonic TPS test needs. Current arc heater test facility availability is a critical-path, schedule bottleneck for hypersonic programs; Improved TPS test capabilities will increase throughput of hypersonic test programs developing TPS. Flight test infrastructure improvements will continue to enable better data collection including high resolution optics, atmospheric measurements, and terminal scoring capability. Investments to improve flight test infrastructure will be initiated to | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603941D8Z / *Test and Evaluation/ Science and Technology* | **Project (Number/Name)**<br>091 / *High Speed Systems Test* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| increase the op tempo of tests and improve data quality in support of hypersonic flight tests. More agile flight tests assets will be developed reducing schedule inflexibility, improving data collection, improving terminal scoring capability, and adding additional instrumentation platforms. Data limitations associated with inflexible test instrumentation assets increases uncertainty & risk in system performance, requiring more test flights to mitigate.<br>Conduct facility flow field characterizations at the Large Energy National Shock (LENS) facilities at Calspan University at Buffalo Research Center (CUBRC), enabling more effective comparisons between similar test facilities and informing test customers of intrinsic flow features in each facility. The characterizations will also provide insight to boundary layer transition studies in the facility. Conduct technology development for a new test capability at LENS to perform long duration aero-optic and ablation testing of interceptors at flight velocities and conditions. The new test capability will enable the ground testing of missile defense, hypersonic, and reentry systems at flight matched conditions for mission relevant test durations.<br>***FY 2021 Plans:***<br>Continue development of improved TPS test facilities increasing TPS test throughput and capacity. New TPS test facility development to include the support of multiple classified programs concurrently will continue along with additional test control cells for independent operations between different arc heaters. New test article preparation areas will reduce test set-up time and increases throughput. Improvements to flight test infrastructure increasing op tempo and data quality will continue to include the continued development of in-flight imaging systems. Continued development of airborne instrumentation capable of reducing atmospheric conditions data uncertainty, critical to assess system design (lift vs. drag), will continue. The development of more agile flight test assets will also continue. Development of airborne assets as flight test instrumentation platforms reduces schedule inflexibility compared to the limited operational tempo of ships & barges. Better data collection to include high resolution optics, improved atmospheric measurements, and terminal area scoring in the Broad Ocean Area (BOA) for end game targeting will continue.<br>Efforts will continue to investigate new flight test techniques, develop new ground test instrumentation, improve and validate CFD codes, and transition HSST technologies to the hypersonic community.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Program Adjustments | | | |
| **Accomplishments/Planned Programs Subtotals** | 33.355 | 112.776 | 74.435 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603941D8Z / *Test and Evaluation/ Science and Technology* | **Project (Number/Name)**<br>091 / *High Speed Systems Test* |

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 3 | R-1 Program Element (Number/Name)<br>PE 0603941D8Z / *Test and Evaluation/ Science and Technology* | Project (Number/Name)<br>092 / *Spectrum Efficient Technology* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 092: *Spectrum Efficient Technology* | 55.894 | 10.682 | 9.340 | 9.725 | - | 9.725 | 9.880 | 10.330 | 10.486 | 10.696 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

Weapon systems have become increasingly complex in recent years, resulting in the need for significantly more data to be passed among these systems as well as between the systems and our test infrastructure. A vast amount of data must be collected, transmitted, and analyzed, which requires a large amount of radio frequency (RF) spectrum resources. However, the amount of RF spectrum designated to support test and evaluation (T&E) is decreasing, most notably due to reallocation of spectrum for commercial use. The combination of decreasing RF spectrum and increasing data requirements results in an urgent need to develop test technologies that maximize the use of spectrum resources for Department of Defense (DoD) T&E operations.

The L- and S- Band frequencies are the traditional spectrum allotted for military T&E use. The explosive need for spectrum in the commercial sector has resulted in reallocation of portions of these bands to industry. To compensate, DoD is now authorized to use the C-Band spectrum which offers numerous benefits, including the potential for a large increase in available bandwidth, but the C-Band spectrum comes with technical challenges and regulatory constraints. Most notably, our current test infrastructure for telemetry is not designed to accommodate C-Band and the band is heavily shared for alternate uses. Technologies are required to implement innovative techniques that efficiently facilitate our use of C-Band without a major overhaul to our national test infrastructure. For instance, commercial telemetry transmitters operate in C-Band but do not have the form factor (size, weight and power) nor ruggedized packaging to survive airborne test applications.

Traditional telemetry applications employ streaming telemetry where data is moved one-way from the instrumented system under test to our test range infrastructure. Modern network based telemetry and cellular based telemetry capabilities enable more robust, efficient bidirectional transfer of data. The DoD strategy is to create technologies for implementing a telemetry capability in C-Band, using the legacy L- and S-Bands for both streaming and networked telemetry, and researching the feasibility of using higher frequency bands to augment telemetry operations.

The Spectrum Efficient Technology (SET) project is developing test technologies that enable more efficient use of legacy telemetry bands and expansion into non-traditional areas of the RF and optical spectra at DoD test ranges. The technology development efforts within the SET project have been prioritized to align with Department of Defense guidance on science and technology priority investments. As such, the SET project is focusing on growing data requirements of warfighting systems and the limited availability of spectrum for testing. The SET project is structured to develop test technologies to advance range communications, networked and cellular based telemetry capabilities, and enhanced management of spectrum at DoD test ranges.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Spectrum Efficient Technology | 10.682 | 9.340 | 9.725 |
| ***Description:*** The SET project risk reduced a ruggedized Ethernet switch for airborne systems in support of the Central Test and Evaluation Investment Program (CTEIP) networked telemetry projects. The ruggedized Ethernet switch addressed CTEIP requirements to fully instrument test aircraft with network enable instrumentation packages to support bi-directional telemetry. The ruggedized switch provides the Ethernet backbone on the aircraft which supports the transport of packetized telemetry data from the onboard instrumentation systems to the telemetry transceiver which transmits the data to the control room. | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603941D8Z / *Test and Evaluation/ Science and Technology* | **Project (Number/Name)**<br>092 / *Spectrum Efficient Technology* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| The SET project successfully demonstrated a software tool capable of accurately estimating current and future spectrum needs. The tool accounted for actual versus scheduled utilization of the spectrum and quantified the cost and schedule implications of the loss of needed spectrum. The spectrum efficient metrics tool provides spectrum managers a planning tool and also provides justification data needed to retain spectrum. The SET project also developed an optimized frequency planning tool supporting frequency re-use planning algorithms for telemetry networks and legacy telemetry systems. This planning tool provides next generation spectrum planning tools allowing for dynamic frequency re-allocation.<br>The SET project completed risk reduction on a networked data recorder and data transmission scheme in support of CTEIP networked telemetry projects. The networked data recorder addressed CTEIP requirements for data recording and parametric extraction during flight testing. The networked data recorder was used as the primary data recorder during CTEIP flight tests. The data transmission scheme is designed to minimize the amount and type of data transmitted over the telemetry network, reducing the amount of bandwidth consumed during a test event. This technology enables more efficient use of the RF spectrum by reducing the amount of data transmitted by only transmitting data parameters when changes occur.<br><br>***FY 2020 Plans:***<br>The SET project will continue to investigate multi-band transceivers operating in the L/S/C-Band spectrum employing multiple advanced modulation schemes showing the ability to change both the frequency and modulation scheme of the telemetry system in near real time based on telemetry link performance and environmental conditions. This technology will determine the performance of the telemetry link and select the optimal modulation scheme based on current link conditions, accounting for issues such as multipath.<br>The SET project will continue to develop technologies to address over-the-horizon telemetry requirements to support the testing of large footprint, long range missiles and hypersonic weapons. A phased array antenna suitable for mounting on a UAS will continue development and its antenna gain performance characterized in a high fidelity laboratory and open air environment. A modular digital beam-forming solution to control a phased array antenna and track multiple targets simultaneously will continue maturation. These technologies will significantly reduce the system complexity for an airborne phased array antenna, providing savings in terms of size, weight, and power consumption.<br><br>***FY 2021 Plans:***<br>The SET project will further advance development of technologies required for network and cellular based telemetry. Airborne phased array telemetry antenna technologies will continue to be matured. Technology enabling the compression of Pulse Code Modulation (PCM) data will transition to support aeronautical telemetry requirements at several test ranges. Efforts to develop spectrum management tools to optimize the use of available RF spectrum and accurately quantify RF spectrum usage on DoD test ranges will complete. Progress will be made on the development of techniques to assess the health and performance of | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603941D8Z / *Test and Evaluation/ Science and Technology* | **Project (Number/Name)**<br>092 / *Spectrum Efficient Technology* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| wireless ground based test support networks in real-time using unobtrusive and bandwidth efficient methods. The SET project will also continue to leverage cellular technologies to support aeronautical telemetry requirements.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Program Adjustments | | | |
| **Accomplishments/Planned Programs Subtotals** | 10.682 | 9.340 | 9.725 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 3 | R-1 Program Element (Number/Name)<br>PE 0603941D8Z / *Test and Evaluation/ Science and Technology* | Project (Number/Name)<br>093 / *Electronic Warfare Test* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 093: *Electronic Warfare Test* | 85.364 | 12.478 | 12.808 | 45.980 | - | 45.980 | 15.675 | 20.452 | 14.318 | 14.604 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

In order to establish dominance in the modern battlespace, our offensive and defensive electronic warfare systems must be capable against advanced radio frequency (RF) directed threats and electro-optic (EO) guided threats, which include infrared (IR) guidance. Ensured dominance in these areas requires more robust test and evaluation (T&E) with technologies that are rapidly adaptable to changing threats.

Readily available, IR seeking, man-portable air defense systems (MANPADS) are difficult to detect and pose an imminent and lethal threat to military aircraft of all types. Our ability to counter such threats is essential to owning the battlespace in theater. Therefore, the ability to test missile warning systems (MWS), hostile fire indicator (HFI) systems, IR countermeasures (IRCM), and advanced threat sensors is critical to our national defense. Additionally, a new generation of enemy RF missile seekers is both currently fielded and in further development, requiring a correspondingly new generation of test technologies to test the latest countermeasures. The T&E community is required to test IRCM and RF countermeasure systems in a repeatable manner with ground-truth data before and after integration into warfighting systems. Without new test technologies, the Department of Defense (DoD) will be unable to perform adequate T&E of advanced warning and countermeasure systems.

The technology development efforts within the Electronic Warfare Test (EWT) project have been prioritized to align with DoD guidance on science and technology priority investments. As such, the EWT project is focusing on the test needs in both the EO, including IR, and the RF threat domains. Additionally, development of core test technologies in this area can be leveraged to meet other EO and RF test requirements, such as in fire control systems; intelligence, surveillance and reconnaissance (ISR) sensors, and weapon seekers.

The EWT project develops test technologies to stimulate IRCM and RF system sensors through the high-fidelity simulation of scenes viewed by the sensors. Stimulation can be as simple as testing to see if a system under test responds to an image or as complex as simulating complex battle space phenomena to measure the response of a system under test in a more relevant, cluttered scenario. Simulations and stimulations are used at open air ranges and in installed system test facilities (ISTF), and in hardware-in-the-loop (HWIL) test beds.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Electronic Warfare Test | 12.478 | 12.808 | 45.980 |
| ***Description:*** The EWT project continued to develop high fidelity scene generation technology for both EO and RF environments. Work continued on the development of hardware and software that generates large number of independent radar targets in a high fidelity hardware-in-the-loop facility. This enabled chamber testing of radars in more dense target environments by generating large numbers of dissimilar false targets. Work continued on high temperature IR scene projectors. Work continued on increasing the efficiency of LED pixels for use in IR scene projectors. Work continued on development of interfaces for use of Active Electronically scanned arrays for open air range threat simulators. | | | |
| ***FY 2020 Plans:***<br>The EWT project will continue prior year efforts to improve the electronic warfare T&E infrastructure. The EWT project will continue the development of wideband, high power EW systems using solid state emitters. This technology enables high fidelity | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603941D8Z / *Test and Evaluation/ Science and Technology* | **Project (Number/Name)**<br>093 / *Electronic Warfare Test* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| threat simulation of next-generation surface-to-air missile systems on a variety of range systems. Technologies to support adaptive EW testing will continue to be investigated. EWT will consider new technologies for lasers or LEDS for open air range IRCM testing. EWT will continue investigating high speed techniques for converting terrain database images for IR scene generation. EWT will also look at surrogate missiles for IRCM open air range testing. EWT will also continue investigating an EW arena to address the “many on many” EW scenarios that need to be tested in a live/virtual/constructive environment.<br>***FY 2021 Plans:***<br>The EWT project will continue prior year efforts to improve the electronic warfare T&E infrastructure. Investigation of alternative technologies for IR scene projectors that reach higher apparent temperatures will continue. Progress will continue on the development of reconfigurable Active Electronically scanned arrays for open air range threat simulators.<br>Design and develop an unmanned rapid prototype target to test sensors and DoD systems against 5th generation electronic warfare threats. The prototype target will enable the testing and assessment of advanced electronic attack measures. Initiate a flight test campaign with the unmanned prototype target to verify system performance and demonstrate 5th generation attributes.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>FY 2021 increase to address 5th generation electronic warfare threats. | | | |
| **Accomplishments/Planned Programs Subtotals** | 12.478 | 12.808 | 45.980 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 3 | R-1 Program Element (Number/Name)<br>PE 0603941D8Z / *Test and Evaluation/ Science and Technology* | Project (Number/Name)<br>094 / *Advanced Instrumentation Systems Technology* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 094: *Advanced Instrumentation Systems Technology* | 58.970 | 11.517 | 10.583 | 11.034 | - | 11.034 | 11.213 | 11.760 | 12.007 | 12.247 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

The Advanced Instrumentation Systems Technology (AIST) project addresses the test technology gaps resulting from emerging weapon systems that need to be tested at Department of Defense (DoD) open air ranges, undersea ranges, installed systems test facilities, hardware-in-the-loop laboratories, and measurement test facilities. Instrumentation requirements for systems under test are increasing exponentially for new weapons systems. Vehicle-borne and warfighter-wearable instrumentation packages are required. This instrumentation is for sensing and collecting critical performance data; determining accurate time, space, position information (TSPI)and attitude information; interfacing with command and control data links; monitoring and reporting system-wide communications; recording human operator physical and cognitive performance; and storing and transmitting data.

The technology development efforts within the AIST project have been prioritized to align with DoD guidance on science and technology (S&T) communities of interest (COIs). The AIST project is focused on supporting technology developments for advanced time, space, position information (TSPI) instrumentation (especially with limited or no availability of the Global Positioning System (GPS)), advanced sensors, advanced energy and power systems for instrumentation, non-intrusive instrumentation, mitigating range encroachment issues, and measuring warfighter physical and cognitive performance. The AIST project addresses requirements for miniaturized, non-intrusive instrumentation suites with increased survivability in harsh environments. Such instrumentation is an urgent need because minimal space is available to add instrumentation to new or existing weapon systems subsequent to their development; furthermore, additional weight and power from instrumentation can adversely affect weapon system signature and performance. Instrumentation for humans-in-the-loop, such as dismounted warfighters, must not adversely affect performance, induce artificiality in the test environment, nor create operational burden. New technologies can be exploited to integrate small, non-intrusive instrumentation into emerging platforms during design and development, and, in some cases, into existing platforms. This class of instrumentation will provide critical system performance data during operational test (OT) and continuous assessment throughout a system's lifecycle. Technology developed under AIST can also benefit training and combat missions by enabling a continual feedback loop between the developer, training staff, operators and commanders.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Advanced Instrumentation Systems Technology | 11.517 | 10.583 | 11.034 |
| ***Description:*** Major thrusts included continuing efforts in advanced sensors, TSPI instrumentation, warfighter physical and cognitive assessment under various workloads and mitigation of test range encroachments.<br>The AIST project transitioned a system to the U.S. Army's Test & Evaluation Command (ATEC) that measures and assesses warfighter cognitive performance under realistic conditions during a T&E event. A personnel tracking system using amplitude modulation (AM) band signals was developed and tested in a relevant environment before transition. The AIST project continued development of technology to evaluate back face deformation of body armor from a blunt trauma event, with final testing planned at Aberdeen Test Center's Light Armor Range Complex. | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603941D8Z / *Test and Evaluation/ Science and Technology* | **Project (Number/Name)**<br>094 / *Advanced Instrumentation Systems Technology* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| The AIST project continued an effort to develop a high fidelity model which takes into account the noisier acoustic properties of shallow water environments (120 feet to 900 feet) for littoral T&E. The model will support early evaluation of undersea test range technologies (e.g., hydrophone arrays, new communication signals/modulations, transducers, and portable instrumentation).<br><br>***FY 2020 Plans:***<br>The AIST project will initiate development of multi-disciplinary technologies addressing T&E requirements for countering small Unmanned Air Systems (UAS) and real-time casualty assessment (RTCA)of warfighter and weapons engagements; sensors to support advanced hypervelocity projectile testing; TSPI data fusion algorithms and technologies; high precision range radar technology to better address current and emerging requirements to track and measure the dynamics of multiple small and large closely spaced objects (e.g., dispensing of sub-munitions, debris, warhead particles, and swarms of independent autonomous airborne vehicles); energy and power for rapidly deployable sea ranges; advanced non-intrusive data management techniques; and mitigation technologies for monitoring effects from electromagnetic interference from solar power towers. The AIST project will complete fiber optic shape sensing technology that accurately provides dynamic measurements during the time history of back face deformation of body armor from a blunt trauma event.<br>The AIST project will investigate technology development of passive imaging technology to derive size, shape, mass, drag coefficients, velocity and vectors for individual fragments during live warhead testing in support of hypersonic high speed test track testing and Broad Ocean Area (BOA) terminal scoring. This technology allows testers to quickly characterize the fragment characteristics and distribution from a munition explosion.<br><br>***FY 2021 Plans:***<br>The AIST project will continue development of: multi-disciplinary technologies addressing T&E requirements for countering small unmanned air systems (UAS) and real-time casualty assessment (RTCA) of warfighter and weapons engagements; sensors to support advanced hypervelocity projectile testing; TSPI data fusion algorithms and technologies; high precision range radar technology; improved energy and power density systems for T&E; advanced non-intrusive data management techniques; and mitigation technologies for monitoring effects from encroachment on test ranges. The AIST project will also continue the investigation and development of advanced instrumentation technologies to support lethality testing and end game scoring of hypersonic systems.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Program Adjustments | | | |
| **Accomplishments/Planned Programs Subtotals** | 11.517 | 10.583 | 11.034 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603941D8Z / *Test and Evaluation/ Science and Technology* | **Project (Number/Name)**<br>094 / *Advanced Instrumentation Systems Technology* |

**C. Other Program Funding Summary ($ in Millions)**

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 3 | R-1 Program Element (Number/Name)<br>PE 0603941D8Z / *Test and Evaluation/ Science and Technology* | Project (Number/Name)<br>095 / *Directed Energy Test* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 095: *Directed Energy Test* | 59.282 | 8.654 | 11.032 | 10.096 | - | 10.096 | 10.572 | 10.932 | 11.057 | 11.278 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

The Department of Defense (DoD) is exploring the military utility, safety, and suitability of directed energy weapons. A robust test capability to assess directed energy weapons is essential to understanding their effectiveness and limitations, including determining their effectiveness in performing counter improvised explosive device (C-IED) operations. Such assessments will depend upon knowledge acquired through the test and evaluation (T&E) of directed energy technologies and testing of operational concepts. Directed energy weapon technologies, primarily consisting of high energy lasers (HEL) and high powered microwaves (HPM), are outpacing available test capabilities. Traditional test techniques for evaluating conventional munitions (with flight times ranging from seconds to minutes) are not sufficient for the T&E of directed energy weapons that place energy on target instantaneously. Consequently, new test technology solutions are needed to ensure that adequate developmental, live-fire, and operational test capabilities are available when directed energy programs are ready to test.

Directed energy system and component testing requires three principal assessments: (1) energy or power on target; (2) the effects on the target; and (3) the propagation of the directed energy to the target through the atmosphere. In addition, the vulnerabilities of DoD systems to directed energy threats are required to be characterized, such as those requirements captured in Military Standard (MIL-STD)-464C. Equally as important, current test capabilities do not provide the detailed data required to understand U.S. directed energy system performance and effects. The technology development efforts within the Directed Energy Test (DET) project have been prioritized to align with DoD guidance on science and technology priority investments. As such, the DET project is developing the technologies necessary for quantitative assessment of United States (U.S.) HEL and HPM performance, as well as the vulnerability of DoD weapon systems to enemy directed energy threats.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Directed Energy Test | 8.654 | 11.032 | 10.096 |
| ***Description:*** The DET project continued efforts to measure HEL energy on small targets such as mortars. The effort designed a recoverable mortar prototype to address Army and Navy requirements and an Air Force requirement for a missile-mounted target board. The DET project continued efforts to develop M&S capability for assessing effects of threat HEL systems on blue aircraft. The DET project continued to mature a dense plasma focus technology to produce strategically relevant, ultra-short pulse neutron fluence levels for nuclear vulnerability testing. The DET project successfully demonstrated neutron production and dense plasma focus technology development continues to be optimized to support neutron production rates scalable to a test facility to be developed by the Central Test and Evaluation Investment Program (CTEIP). A larger chamber was integrated into the facility to test obtaining higher yields. The DET project initiated efforts to support testing of an HPM system integrated with a munition. The DET project initiated new developments in HPM envelope detection. A prototype vertical sensor net array was demonstrated with 4 prototype nodes. The prototype nodes achieved 'first light' at the High Energy Microwave Laboratory (HEML) facility at Kirtland AFB after being exposed to L-band radiation. This prototype sensor array provides rapid/ field expedient diagnostic of a High Power Microwave beam in the far field. | | | |
| ***FY 2020 Plans:*** | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603941D8Z / *Test and Evaluation/ Science and Technology* | **Project (Number/Name)**<br>095 / *Directed Energy Test* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Investments in HEL test technologies will continue to assess the changes in HEL effects due to the shift of HELs to shorter wavelengths near one micron. These technology developments will include efforts to characterize the performance of HEL systems as they engage small targets such as enemy rockets, missiles, artillery, and unmanned aerial vehicles. DET will investigate technologies for assessing the aero-optical effects on HEL propagated from aircraft. DET will continue expansions of efforts to instrument UAVs and other targets with HEL target boards for open air range testing.<br>In the HPM area, measuring the actual cause of HPM effects on electronics will be addressed by measurement of electrical currents within the wires and chips of the electronic targets. DET will continue to investigate new technologies to continue the development of sources for MIL-STD-464C testing. DET will invest in surrogate HPM sources for testing HPM lethality on threat representative targets. DET will also develop X-band sources for use in munitions seeker vulnerability testing. DET will also investigate instrumentation for assessing HPM effects on small UAVs.<br>***FY 2021 Plans:***<br>The DET project will continue developments in HEL test technologies and HPM test technologies to characterize the performance and effectiveness of HEL and HPM systems as they engage small targets, such as enemy rockets, missiles, artillery, and unmanned aerial vehicles, as well as electronic systems and other targets of interest.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Program Adjustments | | | |
| **Accomplishments/Planned Programs Subtotals** | 8.654 | 11.032 | 10.096 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 3 | R-1 Program Element (Number/Name)<br>PE 0603941D8Z / *Test and Evaluation/ Science and Technology* | Project (Number/Name)<br>096 / *C4I & Software Intensive Systems Test* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 096: *C4I & Software Intensive Systems Test* | 107.237 | 12.381 | 11.297 | 11.977 | - | 11.977 | 12.131 | 12.637 | 12.763 | 13.018 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

The Command, Control, Communications, Computers, Intelligence (C4I) and Software Intensive Systems (SIS) (C4T) project addresses test technology gaps in the rapid advancement of C4T warfighting systems. The C4T technology gaps are driven by the more complex environments and distributed systems (e.g. Anti-Access Arial Denial (A2AD); Manned and Unmanned Systems (MUM-T)); big data and intelligence (e.g. Artificial General Intelligence (AGI) and Machine Learning Algorithms (MLA)); and more software intensive systems (e.g. F-35). The technology development efforts within the C4T project have been prioritized to align with DoD guidance on S&T Communities of Interest (CoIs). C4T is developing technologies, including leveraging advancements in machine learning, to analyze and evaluate the increasing mass of structured and unstructured data generated by C4I and SIS testing. The technologies are required when testing sensor platforms, command and control systems and weapon platforms that support the kill chain in a Joint operation. These systems must be evaluated for their ability to provide the accurate, timely transfer of data (e.g. target tracks, weapons allocation, mission tasking, and situational awareness) as the data passes among the Services and coalition participants.

The technologies within C4T will remove undesired distributed testing biases while improving test agility and the tester's ability to effectively support knowledge management, rapid analysis of "Big Data," and automated test reporting. The C4T project advances test automation features (test planning, test execution, Big Data collection, analysis, and visualization) that enable the virtual integration of Department of Defense (DoD) weapon laboratories and open air ranges. Using Modeling and Simulation (M&S) along with hardware-in-the-loop (HWIL) laboratories, the effectiveness of Joint missions can be assessed in terms of system-of-systems interoperability and effectiveness in executing Joint mission operations, including testing of weapons and C4I and SIS systems accessing and providing information.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** C4I and Software Intensive Systems Test | 12.381 | 11.297 | 11.977 |
| ***Description:*** The C4T project continued development of AI technologies in multiple areas of "Big Data" rapid analytics of large structured and unstructured datasets in support of F-35 Test and Evaluation (T&E). This includes the development of an analyst assisting Time Space Position Information (TSPI) tool. The TSPI tool is based on a learning system that combines the analysts' knowledge with the classification knowledge obtained from big data techniques and applies human-like reasoning to achieve an automated post mission processing tool.<br>The C4T project continued development of M&S technologies to support real-time assessments of complex environments such as undersea environments. These technologies provided an acoustic propagation model, both narrow and broad band, of sufficient fidelity to test torpedo performance in various maritime tactical environments. The model included a real-time simulation/ emulation system for testing torpedo sonar systems in multiple bathometry, biological and threat environments.<br>The C4T project completed development of technologies to provide a reliable, fast, and cost-effective approach that enables direct injection Live Virtual Constructive (LVC) testing of next generation weapon systems. The C4T project continued development of a configuration optimization of test support networks. Technologies included planning expeditionary tests, managing bandwidth | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603941D8Z / *Test and Evaluation/ Science and Technology* | **Project (Number/Name)**<br>096 / *C4I & Software Intensive Systems Test* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|

and spectrum contention with a networked system under test, managing battery consumption, providing Real-Time Casualty Assessment (RTCA) data during live tests and providing continuous re-planning capability. These technologies will address deficiencies in Army Operational Test (OT) for network-enabled technologies.
The C4T project initiated the development of deep neutral network technologies for real-time Automated Target Recognition (ATR) using real and synthetic data. These technologies are being developed to support Unmanned Aerial Vehicle (UAV) target recognition.

***FY 2020 Plans:***
The C4T project will continue to invest in developing C4I and SIS technologies to support complex and distributed environments assessing DoD platforms employing “Big Data” techniques with a specific focus on tactical systems and warfighter systems in a net-enabled, dynamic environment.
Technology developments will focus on semantic analysis of large structured and unstructured data sets. These technology developments will include the ability to process unstructured test data into a structured format for analysis using D2D algorithms.
Further work on the correlation and analysis of "Big Data" from multiple sources will continue. Development of techniques to automate the reuse of knowledge to enable continuous developmental testing throughout the lifecycle of weapon systems will continue. Additional investments will be targeted at assessing warfighter systems that in themselves implement D2D, big data, and deep learning technologies.
C4T will continue to develop technologies that mitigate data biases introduced by the test infrastructure. Development will continue on LVC technologies for use by C4I systems to utilize a synthetic battlespace environment to augment the open-air range with vast simulated areas, frequency ranges, and transmitter entities for T&E in contested/dense communications environments. Multi-Level Security (MLS) and Cross Domain Solution (CDS) technologies will be investigated with the goals of improving the automation of preparing test data for analysis as well as facilitating automated sharing of information across all security enclaves.
C4T will investigate M&S technologies to support emulation and stimulation of networks for conducting T&E. C4T will continue to develop representations of systems, communications and environments with the necessary fidelity and run-time performance crucial for the successful testing at HWIL laboratories, installed system test facilities, and open air ranges.
Investments for new technologies addressing: testing warfighter systems employing agile communications, effectiveness evaluation in a mission context, analytics for database intensive warfighter systems, automated test planning, the design of experiments, machine cognitive analysis, and testing human-computer interactions.
Further work targeted at technologies for analysis of large test databases for the F-35 will continue and become tailored for use by ranges supporting live testing for the aircraft.

***FY 2021 Plans:***

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603941D8Z / *Test and Evaluation/ Science and Technology* | **Project (Number/Name)**<br>096 / *C4I & Software Intensive Systems Test* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| The C4T project will investigate M&S technologies to support emulation and stimulation of networks for conducting T&E. The C4T project development will focus on the verification and validation (V&V) of the M&S test environment across battlespace environments in support of both Developmental Test (DT) and OT. The C4T project will continue to develop representations of systems, communications and environments with the necessary fidelity and run-time performance crucial for the successful testing at HWIL laboratories, installed system test facilities, and open air ranges. Continued work targeted at technologies for analysis of large test databases for the F-35 will continue and become tailored for use by ranges supporting live testing for the aircraft along with technologies to assist analysts with the reduction of large complex TSPI datasets. The C4T project will also focus on: testing warfighter systems employing agile communications, effectiveness evaluation in a mission context, analytics for database intensive warfighter systems, and automated test planning and assessments.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Program Adjustments | | | |
| **Accomplishments/Planned Programs Subtotals** | 12.381 | 11.297 | 11.977 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 3 | R-1 Program Element (Number/Name)<br>PE 0603941D8Z / *Test and Evaluation/ Science and Technology* | Project (Number/Name)<br>097 / *Autonomy and Artificial Intelligence Test* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 097: *Autonomy and Artificial Intelligence Test* | 40.518 | 14.490 | 11.050 | 10.648 | - | 10.648 | 11.090 | 11.641 | 11.873 | 12.110 | Continuing | Continuing |

**Note**

Starting in FY2020, Project 097 title will change FROM "Unmanned and Autonomous Systems Test" TO "Autonomy and Artificial Intelligence Test" to more accurately define and describe project workload in terms of the National Defense Strategy and the Under Secretary of Defense (Research and Engineering) prioritization of Artificial Intelligence and machine learning.

**A. Mission Description and Budget Item Justification**

Unmanned and autonomous systems support every domain of warfare -- operating in space, in air, on land, on the sea surface, undersea and in subterranean conditions to support a vast variety of missions. The emergence of Artificial Intelligence (AI) brings a host of revolutionary capabilities that will profoundly influence warfare. The UAST project addresses current and emerging challenges associated with the test and evaluation (T&E) of unmanned systems, particularly in testing autonomy, artificial intelligence, and machine learning. As such, the UAST project is developing test technologies to simulate, stimulate, instrument, measure, and assess an autonomous system's ability to perceive its environment, process information, adapt to dynamic conditions, make decisions, and effectively act on those decisions in the context of mission execution.

The UAST project will provide the test technologies to effectively measure performance and characterize risk, thereby increasing warfighter trust in autonomous systems and artificial intelligence tools. Current DoD test capabilities and methodologies are insufficient to address the testing of increasingly autonomous units operating in unstructured, dynamic, battlespace environments. Furthermore, advancements are being made in developing collaborating, system-of-autonomous-systems that will work in concert as a swarm or pack and in close proximity with humans. New test technologies are needed to stress the collective set of autonomous systems under realistic conditions, predict emergent behavior of autonomous systems, emulate the complex environment, and assess mission performance of these highly coupled and artificially intelligent systems.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Autonomy and Artificial Intelligence Test | 14.490 | 11.050 | 10.648 |
| ***Description:*** The AAIT project continued test technology development supporting the near term challenges identified in the 2013–2038 DoD Unmanned Systems Integrated Roadmap, such as, integrating DoD unmanned systems within the National Airspace and safely operating unmanned aerial systems within the Major Range and Test Facility Bases (MRTFB). The AAIT project collaborated with the Autonomy Community of Interest (COI) Test and Evaluation, Verification and Validation (TEVV) Working Group to ensure that the AAIT project is investing in technologies relevant to the future of autonomous systems.<br>The AAIT project explored technologies required for T&E of emerging UAS architectures, functional components, and interfaces. The AAIT project emphasized autonomy test technologies that can be integrated for use in a Test and Training Enabling Architecture (TENA) environment within the MRTFB. The AAIT project continued investments in robustness testing technology to detect and predict vulnerabilities and failures within UAS software. The AAIT project transitioned developments to automatically | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603941D8Z / *Test and Evaluation/ Science and Technology* | **Project (Number/Name)**<br>097 / *Autonomy and Artificial Intelligence Test* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|

predict test vehicle collision potentials and cue test range controllers to take corrective action. These technologies prevent the test vehicle from violating flight envelopes, range boundaries, and warning areas. The AAIT project completed an effort to develop a software tool that will enable testers to monitor the internal autonomous processing states of a system under test without interfering with its operations or requiring modification to the system's software or hardware. The AAIT project completed efforts that rapidly identify challenging test scenarios for an undersea unmanned vehicle (UUV) under test. The effort identified performance boundaries for autonomy as they relate to the environment, mission, and vehicle state spaces; this technology transitioned to the Naval Undersea Warfare Center-Keyport.

The AAIT project continued development of technology to address the T&E of ground and air autonomy using optimization algorithms to rapidly generate salient test scenarios. Expansion to the ground domain continued with the integration of AAIT technology into the Autonomous Ground Resupply (AGR) autonomy within the Autonomous Navigation Virtual Environment Laboratory (ANVEL) simulation. The integrated autonomy simulation will be used to validate AAIT technologies in the ground domain. New architecture and state space designs better support multiple domains of autonomy testing. Unmanned Ground Vehicle and Undersea Vehicle domains test technology development will risk reduce CTEIP autonomous test capability development efforts.

***FY 2020 Plans:***

The AAIT project will continue to initiate and develop technologies to support autonomous system test planning, autonomous system test execution, and autonomous system performance assessment. Efforts within test planning will include predicting autonomous behavior for testing and assuring thorough testing of autonomous systems. Investments in test execution will include: enhancing safety of autonomous system testing; creating test environments that are complex, immersive, and reactive; and adapting ranges to cognitive, autonomous system testing. Developments under performance assessment will include: testing and evaluating UAS-to-UAS and human-to-UAS interactions and measuring autonomous system reliability.

The AAIT project will complete development of technologies that automatically learn conditions for activating vulnerabilities deep within an autonomous system, using machine learning and backward chaining techniques to determine system level inputs that induce failure.

***FY 2021 Plans:***

The AAIT project will continue to initiate and develop technologies to support autonomous system test planning, autonomous system test execution, and autonomous system performance assessment. Efforts within test planning and assessment will transition to multiple autonomy test capabilities under development in the Central Test & Evaluation Investment Program (CTEIP) and at DoD test ranges and laboratories.

***FY 2020 to FY 2021 Increase/Decrease Statement:***

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603941D8Z / *Test and Evaluation/ Science and Technology* | **Project (Number/Name)**<br>097 / *Autonomy and Artificial Intelligence Test* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Program Adjustments | | | |
| **Accomplishments/Planned Programs Subtotals** | 14.490 | 11.050 | 10.648 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 3 | R-1 Program Element (Number/Name)<br>PE 0603941D8Z / *Test and Evaluation/ Science and Technology* | Project (Number/Name)<br>098 / *Cyberspace Test* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 098: *Cyberspace Test* | 27.358 | 11.002 | 12.688 | 13.170 | - | 13.170 | 13.351 | 13.934 | 14.170 | 14.453 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

The Department of Defense (DoD) ability to use cyberspace for rapid communication and information sharing in support of operations is a critical enabler of DoD military missions. Advancements in utilizing cyberspace are outpacing the technologies needed for test and evaluation (T&E). The Cyberspace Test Technology (CTT) project develops advanced technologies and methodologies to test and evaluate DoD capabilities and information networks to defend and conduct full-spectrum military operations across cyberspace. Current cyberspace T&E capabilities are insufficient to support the continual experimental, contractor, developmental, operational, and live-fire testing requirements of warfighter systems operating in cyberspace. Many of the test tools and infrastructure items required for systems in cyberspace will require advancement and maturation of nascent test technologies. The CTT project will address test technology shortfalls in cyberspace testing, including planning cyberspace tests, creating representative cyberspace threats and test environments, executing cyberspace tests, and performing cyberspace test analysis and evaluation.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Cyberspace Test | 11.002 | 12.688 | 13.170 |

***Description:*** The CTT project continued development of technologies to detect, monitor, and analyze malware behavior during cyber-attacks in a virtualized T&E environment. The CTT project continued development of a capability to systematically verify (attest) that all persistent storage in an aircraft's avionics subsystems have not been altered. This technology development works to ensure that a weapon system has not been modified by malicious action or legitimate cyber T&E activities. The CTT project also continued development of an assisted cyber intelligence behavior testing technology that uncovers cyber vulnerabilities at machine speed and scale. This enables the evaluation of systems under test using automated means to find and fix vulnerabilities otherwise unknown to software developers and end users.

***FY 2020 Plans:***

The CTT project will pursue technology developments addressing needs for three domains – Cyber-Physical Systems, Tactical Edge Networks, and Enterprise Information Systems. In Cyber Physical Systems hypervisors/emulators for Kinetic Systems and Cyber Physical Networks will continue to be developed, instrumentation for cyberspace data collection, improved cyberspace analysis tools that show real time effects of cyberspace attacks on cyber-physical systems, and cyber Test Execution Tools. In the Tactical Edge networks domain we will continue the development of scalable cyberspace test environments, develop tools for mapping complex systems in test networks, and tools for visualization. In Enterprise Information Systems, we will develop emulated Cyberspace threats, develop tools for cyberspace threat attack control, develop tools for testing resiliency of infrastructure and systems, and develop artificial intelligent analysis for enterprise threat detection and mitigation.

***FY 2021 Plans:***

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603941D8Z / *Test and Evaluation/ Science and Technology* | **Project (Number/Name)**<br>098 / *Cyberspace Test* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| The CTT project will continue to pursue technology developments addressing needs in Cyber-Physical Systems, in Tactical Edge Networks, and in Enterprise Information Systems.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Program Adjustments | | | |
| **Accomplishments/Planned Programs Subtotals** | 11.002 | 12.688 | 13.170 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603950D8Z / *National Security Innovation Network* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 0.000 | 0.000 | 40.000 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| 845: *National Security Innovation Network* | 0.000 | 0.000 | 40.000 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

The National Security Innovation Network (NSIN) is a program office within the Office of the Under Secretary of Defense for Research and Engineering with a mission to build new networks of innovators that generate new solutions to national security problems. NSIN develops programs and services that are designed to help other DoD entities from the Military Services, Joint Staff, Combatant Commands, and Defense Agencies and Field Activities solve problems with non-traditional partners. NSIN is organized around three core lines of effort. These lines of effort include: 1) creating new opportunities for National Security Service by building models of service that account for generational and cultural differences between the military, academic, and venture communities and providing flexible pathways to official service within the Department of Defense; 2) solving national security problems by collaborating with partners from the academic and venture communities by engaging new problem-solvers in collision events with DoD customers that generate novel concepts and solutions and building a national network of problem-solving ecosystems that leverage the competitive advantages of regions and commercial innovation hubs for DoD customers; and 3) accelerating the adoption of novel concepts and solutions by facilitating engagement with DoD end users and transition partners to stimulate dual-use venture growth and improving Technology Transfer and Transition (T3) rates for DoD lab technology through dual-use commercialization via early-stage ventures.

NSIN, working in partnership with other DoD innovation initiatives, seeks to maintain the long-term competitive advantage for the US military over peer and near-peer adversaries by tapping into high-potential uniformed and civilian employees of the DoD (i.e. intrapreneurs) and exponentially increasing with non-traditional innovators and entrepreneurs outside of the DoD. NSIN's programs and its physical and virtual network are the channels through which NSIN achieves its mission.

NSIN's physical network is composed of 11 Regional Directors, each of which is located in critical venture innovation hubs throughout the country (Boston, MA; NYC, Washington, DC; Raleigh, NC: Chicago, IL: St. Louis, MO: Austin, TX; Denver, CO; Seattle, WA: San Diego, CA: and San Francisco, CA) and supported by University Program Directors (UPDs) that are embedded at critical universities throughout the country and are co-located with emerging or extant venture ecosystems. At objective stated, NSIN envisions approximately 35 such UPDs throughout the country and in all 50 states.

NSIN, under its previous MD5 nomenclature, has been a Congressional interest program that has received funding in FY2016 ($5M), FY2017 ($25M), FY2018 ($25.5M), and FY 2019 ($15M) in the former PE 0603680D8Z. FY2020 is the first year for the establishment of an independent PE for this program.

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0603950D8Z *I National Security Innovation Network* |

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 0.000 | 25.000 | 0.000 | - | 0.000 |
| Current President's Budget | 0.000 | 40.000 | 0.000 | - | 0.000 |
| Total Adjustments | 0.000 | 15.000 | 0.000 | - | 0.000 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | 0.000 | 15.000 | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | - | - | | | |

| Congressional Add Details ($ in Millions, and Includes General Reductions) | FY 2019 | FY 2020 |
|---|---|---|
| **Project:** 845: *National Security Innovation Network* | | |
| Congressional Add: *NSIN* | 0.000 | 15.000 |
| Congressional Add Subtotals for Project: 845 | 0.000 | 15.000 |
| Congressional Add Totals for all Projects | 0.000 | 15.000 |

**Change Summary Explanation**

The FY 2020 $25.000 million plus the $15.000 million Congressional Add will fund three portfolios of effort: Service, Collaboration, and Acceleration designed to create new pathways to national security service to solve DoD problems in non-traditional ways.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 3 | R-1 Program Element (Number/Name)<br>PE 0603950D8Z / *National Security Innovation Network* | Project (Number/Name)<br>845 / *National Security Innovation Network* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 845: *National Security Innovation Network* | 0.000 | 0.000 | 40.000 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

The National Security Innovation Network (NSIN) is a program office within the Office of the Under Secretary of Defense for Research and Engineering with a mission to build new networks of innovators that generate new solutions to national security problems. NSIN develops programs and services that are designed to help other DoD entities from the Military Services, Joint Staff, Combatant Commands, and Defense Agencies and Field Activities solve problems with non-traditional partners. NSIN is organized around three core lines of effort. These lines of effort include: 1) creating new opportunities for National Security Service by building models of service that account for generational and cultural differences between the military, academic, and venture communities and providing flexible pathways to official service within the Department of Defense; 2) solving national security problems by collaborating with partners from the academic and venture communities by engaging new problem-solvers in collision events with DoD customers that generate novel concepts and solutions and building a national network of problem-solving ecosystems that leverage the competitive advantages of regions and commercial innovation hubs for DoD customers; and 3) accelerating the adoption of novel concepts and solutions by facilitating engagement with DoD end users and transition partners to stimulate dual-use venture growth and improving Technology Transfer and Transition (T3) rates for DoD lab technology through dual-use commercialization via early-stage ventures.

NSIN, working in partnership with other DoD innovation initiatives, seeks to maintain the long-term competitive advantage for the US military over peer and near-peer adversaries by tapping into high-potential uniformed and civilian employees of the DoD (i.e. entrepreneurs) and exponentially increasing with non-traditional innovators and entrepreneurs outside of the DoD. NSIN's programs and its physical and virtual network are the channels through which NSIN achieves its mission.

NSIN's physical network is composed of 11 Regional Directors, each of which is located in critical venture innovation hubs throughout the country (Boston, MA; NYC, Washington, DC; Raleigh, NC: Chicago, IL: St. Louis, MO: Austin, TX; Denver, CO; Seattle, WA: San Diego, CA: and San Francisco, CA) and supported by University Program Directors (UPDs) that are embedded at critical universities throughout the country and are co-located with emerging or extant venture ecosystems. At objective stated, NSIN envisions approximately 35 such UPDs throughout the country and in all 50 states.

NSIN, under its previous MD-5 nomenclature, has been a Congressional interest program that has received funding in FY 2016 ($5.000 million), FY 2017 ($25.000 million), FY 2018 ($25.500 million), and FY 2019 ($15.000 million) in the former PE 0603680D8Z. FY 2020 is the first year for the establishment of an independent PE for this program.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** National Security Innovation Network (NSIN) | - | 25.000 | - |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603950D8Z / *National Security Innovation Network* | **Project (Number/Name)**<br>845 / *National Security Innovation Network* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Description:*** The NSIN mission is to build networks of innovators to generate new solutions for national security problems. It does this through three portfolios of programs and services designed to catalyze non-traditional problem-solving capabilities that combine warfighters, early-stage ventures, and applied academic communities at top-tier research universities.<br><br>***FY 2020 Plans:***<br>Funding in FY 2020 will continue activities initiated in FY 2019 under the former PE and support achievement of the following goals:<br><br>1. Expand the number of new participants within the National Security Innovation Base by 500, including at lease 25 permanent hiring actions created through access to NSIN's National Service Portfolio of programs;<br>2. Develop regional hubs in 13 commercial innovation hubs throughout the US and in Europe to support our NATO allies and embed personnel at 15 university partner locations;<br>3. Achieve a solution adoption rate in excess of 70% against at least 200 submitted DoD problem sets;<br>4. Develop baseline network scores that assess the holistic health of the problem import/solution export function envisioned throughout each of NSIN's 11 regions and throughout the broader national network;<br>5. Identify, curate, and disseminate at least 200 sponsored problems each year with non-traditional innovators;<br>6. Scale current Proof-of-Concept Center into at least two other locations, producing at least 10 design-build prototypes each quarter;<br>7. Increase the number of national security-focused start-ups created as a result of NSIN programming to at least 30 each year;<br>8. Facilitate 20 successful technology transfers from DoD labs each quarter.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>No budget has been allocated by the DoD for NSIN in FY 2021. | | | |
| **Accomplishments/Planned Programs Subtotals** | - | 25.000 | - |

| | FY 2019 | FY 2020 |
|---|---|---|
| ***Congressional Add:*** NSIN | 0.000 | 15.000 |
| ***FY 2019 Accomplishments:*** In FY 2019, under PE 063680D8Z, NSIN executed $15.000 million which met or exceeded each of its programmatic goals:<br><br>- Through programs within NSIN's Collaboration Portfolio (like Hacking for Defense (H4D), Hackathons, demonstration days, SBIR execution support for the Air Force Research Lab (AFRL) and AFWERX), achieved a 73% solution adoption rate against more than 150 problems provided by DoD customers utilizing NSIN | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0603950D8Z / *National Security Innovation Network* | **Project (Number/Name)**<br>845 / *National Security Innovation Network* |

| | FY 2019 | FY 2020 |
|---|---|---|
| programming. This includes approximately 10% of solutions that have already transitioned back to DoD customers in the form of contracted dual-use ventures and/or budget allocations towards new programs or record.<br><br>- Almost 50 new hires through fellowships, internships, and other project-based work from more than 13 different universities, including 9 new, full-time hires into the Department of Defense through NSIN's new National Service Portfolio.<br><br>- Net growth of 43 new, dual-use ventures launched in response to a direct, DoD customer demand signal as a result of NSIN's focus through its Acceleration Portfolio on customer discovery and making DoD problems more legible for early-stage (Seed to A-Round) ventures seeking to do business with the DoD.<br><br>- 14 dual-use ventures launched from extant DoD lab technology through the Defense Innovation Accelerator (DIA) program that is specifically designed to improve DoD lab technology transfer and transition (T3) rates.<br><br>***FY 2020 Plans:*** The additional funding in FY 2020 will increase the planned activities for FY 2020 and support the achievement of those goals. | | |
| **Congressional Adds Subtotals** | 0.000 | 15.000 |

**C. Other Program Funding Summary ($ in Millions)**

| Line Item | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|
| • 0603680D8Z: *National Security Technology Accelerator* | 15.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

**Remarks**

FY 2019 RDT&E funds were in PE 0603680D8Z as a Congressional add.

**D. Acquisition Strategy**

N/A

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0604055D8Z / *Operational Energy Capability Improvement* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 39.788 | 44.362 | 64.900 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| 455: *Operational Energy Capability Improvement* | 39.788 | 44.362 | 64.900 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

**Note**

FY 2021 - FY 2025 funds were re-aligned for higher Department priorities under the Defense Wide Review (DWR).

**A. Mission Description and Budget Item Justification**

The U.S. military's dependence on liquid fuel creates an enormous logistics burden that exposes forces to enemy attack and diverts operational resources from other mission areas to support delivery. GAO cited the department for its lack of (1)"visibility and accountability for achieving fuel reduction, (2) incentives and a viable funding mechanism to invest in the implementation of fuel demand reduction projects, and (3) guidance and policies that addressed fuel demand."

The mission of this program element (PE) since these findings in 2012 has been to fund innovation to improve the Department of Defense's (DoD) operational effectiveness via targeted operational energy science and technology (S&T) investments. OECIF fostered innovation to improve operational energy performance in two ways: first, to develop operational energy technologies and practices that improved the agility and resiliency of our ability to supply forces the energy they need; and second, to establish momentum for components to continue those innovations through ongoing collaboration with the Services, Joint Staff and Combatant Commands.

OECIF funds served as "seed money" to start or consolidate promising innovations to serve as proof of technological feasibility, with the goal of transitioning science and technology (S&T) into the acquisition process. The focus is on challenges or opportunities that are not Services specific, but rather cross Services, platforms and domains.

OECIF investments also highlighted areas of Departmental level interest or buy down risk to enable service-level commitments. The primary focus on 6.3 Investments facilitated joint solutions and incentivized cross Service collaboration to transition the acquisition valley of death. OSD investment (37%) in conjunction with investment from DLA, Army, Navy, and USMC of 22% represents almost 60% of the DoD-wide OE 6.3 investment budget. The Air Force contributes about 40% with 55% of their contribution focused on high-cost engine testing and architecture for high power systems.

OECIF investments are directly focused on the capability needs expressed in the NDS. Our ability to predict, detect, and mitigate an adversary's ability to deny tactical and operational formations the energy needed to prosecute operations at tempo and scale throughout every phase of warfare and to enable freedom of action at all echelons, unencumbered by the challenges of delivering energy across an unbounded multi-domain and contested battlespace.

To achieve these goals, the selection process for investments relied on inputs from the Combatant Commands and Services each year through a competitive process. The OECIF decision process supports the National Security Strategy for energy dominance, all three National Defense Strategy priorities, the DoD Energy Strategy,

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0604055D8Z / *Operational Energy Capability Improvement* |

Department Modernization Priorities, and the needs of the Joint Force and warfighters. The projects compete on the basis of greatest impact to the warfighter, criticality of operational need, least technical risk, least cost, and the shortest time to employment.

OECIF success has been measured by its impact. The overall aim has been to improve the agility, resilience, lethality, readiness, and operational effectiveness of the Joint Force. The key metric is the successful transition of technology from S&T to an acquisition or direct insertion into operations. Over 75% of OECIF investments have successfully transitioned to support the warfighter.

OECIF's efforts have complimented, not replaced or duplicated, Services investments and have provided a continuingly evolving program to rapidly address new and critical issues arising from emerging threats to our ability to supply the joint force.

Examples of current investments include moving power without mass (power beaming); world-record setting efficiencies for solar power conversion; use of energy scavenging within the warfighting environment, and use of sensors, data analytics and predictive methodologies with the promise of enabling unparalleled operational unpredictability to counter an adversaries "energy denial" operations. Additional leading technologies enabling extended remote operations without resupply through innovations in the use of energy storage, micro-grids, and nuclear power fuel innovation.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 45.478 | 70.536 | 41.261 | - | 41.261 |
| Current President's Budget | 44.362 | 64.900 | 0.000 | - | 0.000 |
| Total Adjustments | -1.116 | -5.636 | -41.261 | - | -41.261 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | -10.636 | | | |
| • Congressional Adds | - | 5.000 | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | -1.108 | - | | | |
| • Other Adjustments | -0.008 | - | -3.337 | - | -3.337 |
| • Reduction for Defense Wide Review | - | - | -37.924 | - | -37.924 |

| Congressional Add Details ($ in Millions, and Includes General Reductions) | FY 2019 | FY 2020 |
|---|---|---|
| **Project:** 455: *Operational Energy Capability Improvement* | | |
| Congressional Add: *Operational Energy Capability Improvement Program Increase* | 5.000 | 5.000 |
| Congressional Add Subtotals for Project: 455 | 5.000 | 5.000 |
| Congressional Add Totals for all Projects | 5.000 | 5.000 |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0604055D8Z *I Operational Energy Capability Improvement* |

**Change Summary Explanation**

In FY 2020, the Congress reduced the program by -$10.636 million for excess growth and provided a program increase of $5.000 million.

FY 2021 included a reduction for higher priority DoD missions and included a Defense-Wide Review (DWR) reduction of $37.924 million.

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| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 3 | R-1 Program Element (Number/Name)<br>PE 0604055D8Z / *Operational Energy Capability Improvement* | Project (Number/Name)<br>455 / *Operational Energy Capability Improvement* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 455: *Operational Energy Capability Improvement* | 39.788 | 44.362 | 64.900 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

**Note**

FY 2021 - FY 2025 funds are realigned to higher priority DoD missions resulting from Defense Wide Review.

**A. Mission Description and Budget Item Justification**

The Operational Energy Capability Improvement Fund (OECIF) incentivizes science and technology (S&T) to promote long-term change in DoD capabilities so they are better aligned with the National Defense Strategy. OECIF fosters innovation to improve operational energy performance and has two key mission aspects: first, to develop operational energy technologies and practices that will improve DoD military capabilities or reduce costs; and second, to establish within the military Services institutional momentum to continue those innovations. OECIF serves as “seed money” to start or consolidate promising operational energy innovation to be sustained by the Services. Accordingly, OECIF generally emphasizes supporting or establishing programs rather than one-off projects.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Operational Energy Capability Improvement Fund (OECIF) | 39.362 | 19.029 | - |
| ***FY 2020 Plans:***<br>Operational Energy Capability Improvement (OECIF) will ramp down to allow existing projects to close out.<br><br>FY 2017 projects for far-field wireless energy transmission will be completed. These include efforts across 3 modalities of power beaming (Laser, mmWave, and RF). World-records set in eye-safe Laser power will increase in power and distance. Efforts in mmWave, RF will demonstrate at least 1kW @ 1 km. World-record setting perovskite solar cell efforts will conclude with delivery and test of multi-junction cells. New manufacturing for space-based solar cells will transition to the Air Force partner to continue this effort for reducing costs applicable to all space launches by an order of magnitude.<br><br>Complete/finalize the following efforts:<br>• Undersea thermal energy generation<br>• Long duration UAX with a focus on INDOPACOM<br>• Energy Sensing for efficiency<br>• Ultra High Density Hybrid Energy Storage Module (HEMS) for Laser Weapon System and Electronic Warfare Operations<br>• Power and Thermal Management for High Power / Pulse Power systems and integration<br><br>Deliver critical outcomes for: Hybridization of Energy Storage Hardware that increases range and endurance of current UAS. Results will be ready for flight test demonstrations. | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0604055D8Z / *Operational Energy Capability Improvement* | **Project (Number/Name)**<br>455 / *Operational Energy Capability Improvement* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Validate and qualify Operation of Energy Efficient Multi-Mission Fuel/ISR/Strike Pods for UAVs for use, per COCOM direction.<br><br>Transition critical, novel fire suppression techniques to enable the safe military transport of Lithium Ion batteries.<br><br>Enable secondary controls for the use of source agnostic inverters and energy storage devices needed to stabilize the operation of any fielded micro-grid ensuring operational flexibility of the battle commander.<br><br>Enable specifications and safety standards for a standardized battery architecture based on commercial technologies for compatibility with multiple DOD platforms.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>DWR: The decrease reflects internal re-alignments for higher DoD priorities under the Defense Wide Review. | | | |
| ***Title:*** Space Solar / Power Beaming<br><br>***Description:*** Previous FY 2017-FY 2019 P455 OECI investments focused on reducing weight and improving growth and performance of solar cells. Early investment also focused on technological advances to improve metrology for energy collection in space, and both efforts continue advancing. Success of previous OECI investments in laser safety and mmWave transmission has increased confidence for demonstrating a longer/larger project viability.<br><br>The Space Solar / Power Beaming project implements a front-loaded sprint to recapture the lead in critical technologies with both near-term tactical and far-term strategic implications. Near-peer competitors are overmatching DoD in power beaming and space solar technologies for battlefield advantage, necessitating this effort to address the shortfalls. Per the findings and recommendations of the recent DoD study “Opportunities and Challenges for Space Solar for Remote Installations," measured, comprehensive investments will be made in key areas to accomplish demonstrations that jumpstart the effort.<br><br>***FY 2020 Plans:***<br>Complete efforts begun in FY 2017 for power beaming and space solar (see above). These elements advance efforts for power beaming and space solar capabilities to increase warfighter lethality and reduce logistical burdens.<br><br>For ground-to-ground, elevated, high-altitude, low earth orbit, and higher orbits, the progression of power beaming capabilities to include longer links and higher powers will provide a credible path to an operational capability.<br><br>(1) Space Solar Collection – Low-cost, lightweight photovoltaics through revolutionary production methods are key to manufacturing at scale. | 0.000 | 40.871 | - |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0604055D8Z / *Operational Energy Capability Improvement* | **Project (Number/Name)**<br>455 / *Operational Energy Capability Improvement* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| (2) Microwave Power Beaming Link Demonstration – Using existing sources, microwave power beaming will be demonstrated using rectenna receiver modules developed during FY 2020. This represents the first step towards an all-weather, global system..<br>(3) Millimeter Power Beaming Link Demonstration – Leveraging proven non-lethal transmission sources, a tactically relevant power beaming demonstration will be undertaken using millimeter wave rectenna receiver modules developed during FY 2020.<br>(4) Optical Power Beaming Link Demonstration – Integrating proven laser safety systems with appropriate directed energy assets will form the transmission segment for the optical demonstration. The optical receiver will be developed employing recent advances in monochromatic photovoltaic technology.<br>(5) Architecture Analytics & Integrating Technologies – Scenario modeling of different means of energy conversion and ground and space segment approaches will focus investments and drive concept of operations development. Leap-ahead technologies in large area metrology, high-altitude receiver craft, thermal management, high voltage management, and airborne tether technologies will be examined for potential integration into near-term deployed power beaming and far-term space solar capabilities.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>DWR: The decrease reflects internal re-alignments for higher DoD priorities under the Defense Wide Review. | | | |
| **Accomplishments/Planned Programs Subtotals** | 39.362 | 59.900 | - |

| | FY 2019 | FY 2020 |
|---|---|---|
| ***Congressional Add:*** Operational Energy Capability Improvement Program Increase | 5.000 | 5.000 |
| ***FY 2019 Accomplishments:*** The Study on the Use of Mobile Nuclear Power Plants for Ground Operations concluded political support is essential in three key areas: nuclear fuel availability, supportive regulatory environment, and advanced reactor designs. Awarded a Tristructural-Isotropic (TRISO) fuel production subcontract to demonstrate TRISO fuel production at engineering scale. Invested in Air Force SBIR on strontium based source for terrestrial and space applications. | | |
| ***FY 2020 Plans:*** Developing initial innovation toward an industrial-scale capability to produce TRISO fuel with the capability of producing a variety of kernel sizes and types, and at all levels of enrichment. This funding allows for initial innovative work to kick-start a larger program necessary to produce necessary quantities of total qualified TRISO by the end of FY 2020. | | |
| **Congressional Adds Subtotals** | 5.000 | 5.000 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0604055D8Z / *Operational Energy Capability Improvement* | **Project (Number/Name)**<br>455 / *Operational Energy Capability Improvement* |

**C. Other Program Funding Summary ($ in Millions)**

**Remarks**

**D. Acquisition Strategy**

N/A

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0303310D8Z *I Countering Weapons of Mass Destruction (CWMD) Systems: Advanced Technology Development* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 224.279 | 25.619 | 28.907 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| 004: *CWMD Systems: Advanced Technology Development* | 224.279 | 25.619 | 28.907 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

**Note**

In FY 2021, this program was eliminated as a result of the Defense-wide Review.

**A. Mission Description and Budget Item Justification**

The Countering Weapons of Mass Destruction (CWMD) Systems portfolio aligns with the National Defense Strategy objective of “dissuading, preventing, or deterring state adversaries and non-state actors from acquiring, proliferating, or using weapons of mass destruction.”

The CWMD Systems portfolio enhances warfighter lethality by developing capabilities to analyze and exploit critical nodes of nuclear, chemical, and biological weapons and ballistic missile programs and proliferation networks; and developing offensively-oriented capabilities to disrupt WMD proliferation networks and detect, disable, or defeat WMD and delivery systems. Investments result in capabilities fielded to the Joint Force, enabling it to reduce WMD threats and create options for the United States to prevent WMD use.

The Office of the Secretary of Defense uses the CWMD Systems portfolio to invest strategically in projects across the Military Services, Combatant Commands, and Defense Agencies. Funding is prioritized for projects that close Joint Force warfighter capability gaps. An annual investment strategy is used to meet emergent operational and capability needs submitted by the Joint Force, yielding new fielded capabilities within one to two years.

The CWMD Systems: Advanced Technology Development program invested in innovative technologies and non-materiel initiatives, accelerating development of new capabilities to illuminate WMD networks; assessed vulnerabilities in networks, programs, facilities, and weapons systems; and developed technologies to disable or defeat WMD. Funding also sponsors research, analyses, and table-top exercises related to countering WMD proliferation by government and non-government organizations.

This appropriation funded labor, materials, and travel to support the requirements of this program, performed by a government agency or by private individuals or organizations under a contract with the government, for activities and acquisitions including RDT&E, assessments and analyses, research studies, education, and other activities related to capability development and fielding.

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 3: *Advanced Technology Development (ATD)* | **R-1 Program Element (Number/Name)**<br>PE 0303310D8Z *I Countering Weapons of Mass Destruction (CWMD) Systems: Advanced Technology Development* |

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 26.583 | 28.907 | 28.632 | - | 28.632 |
| Current President's Budget | 25.619 | 28.907 | 0.000 | - | 0.000 |
| Total Adjustments | -0.964 | 0.000 | -28.632 | - | -28.632 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | -0.960 | - | | | |
| • Other Program Adjustments | - | - | -18.729 | - | -18.729 |
| • Cancelled Account | -0.004 | - | - | - | - |
| • Defense Wide Review Adjustment | - | - | -9.903 | - | -9.903 |

**Change Summary Explanation**

Decrease from FY 2020 to FY 2021 is the result of redistribution of funding from Countering Weapons of Mass Destruction (CWMD) Systems: Advanced Technology Development (PE# 0303310D8Z) to CWMD Systems: System Development and Demonstration (PE# 0305310D8Z) and CWMD Systems: Operational Systems Development (PE# 0607310D8Z) as part of the Defense Wide Review. This redistribution supports the Department’s need to prioritize investment in fieldable capabilities to enhance Joint Force lethality in countering WMD proliferation and use. In FY 2021, this program was eliminated as a result of the Defense-wide Review.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 3 | R-1 Program Element (Number/Name)<br>PE 0303310D8Z / *Countering Weapons of Mass Destruction (CWMD) Systems: Advanced Technology Development* | Project (Number/Name)<br>004 / *CWMD Systems: Advanced Technology Development* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 004: *CWMD Systems: Advanced Technology Development* | 224.279 | 25.619 | 28.907 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

**Note**

In FY 2021, this program was eliminated as a result of the Defense-wide Review.

**A. Mission Description and Budget Item Justification**

The Countering Weapons of Mass Destruction (CWMD) Systems portfolio aligns with the National Defense Strategy objective of “dissuading, preventing, or deterring state adversaries and non-state actors from acquiring, proliferating, or using weapons of mass destruction.”

The CWMD Systems portfolio enhances warfighter lethality by developing capabilities to analyze and exploit critical nodes of nuclear, chemical, and biological weapons and ballistic missile programs and proliferation networks; and developing offensively-oriented capabilities to disrupt WMD proliferation networks and detect, disable, or defeat WMD and delivery systems. Investments result in capabilities fielded to the Joint Force, enabling it to reduce WMD threats and create options for the United States to prevent WMD use.

The Office of the Secretary of Defense uses the CWMD Systems portfolio to invest strategically in projects across the Military Services, Combatant Commands, and Defense Agencies. Funding is prioritized for projects that close Joint Force warfighter capability gaps. An annual investment strategy is used to meet emergent operational and capability needs submitted by the Joint Force, yielding new fielded capabilities within one to two years.

The CWMD Systems: Advanced Technology Development program invested in innovative technologies and non-materiel initiatives, accelerating development of new capabilities to illuminate WMD networks; assessed vulnerabilities in networks, programs, facilities, and weapons systems; and developed technologies to disable or defeat WMD. Funding also sponsors research, analyses, and table-top exercises related to countering WMD proliferation by government and non-government organizations.

This appropriation funded labor, materials, and travel to support the requirements of this program, performed by a government agency or by private individuals or organizations under a contract with the government, for activities and acquisitions including RDT&E, assessments and analyses, research studies, education, and other activities related to capability development and fielding.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** P*004 / CWMD Systems: Advanced Technology Development | 25.619 | 28.907 | 0.000 |
| ***Description:*** The CWMD Systems: Advanced Technology Development program invested in innovative technologies and non-materiel initiatives, accelerating development of new capabilities to illuminate WMD networks; assessed vulnerabilities | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0303310D8Z / *Countering Weapons of Mass Destruction (CWMD) Systems: Advanced Technology Development* | **Project (Number/Name)**<br>004 / *CWMD Systems: Advanced Technology Development* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| in networks, programs, facilities, and weapons systems; and developed technologies to disable or defeat WMD. Funding also sponsors research, analyses, and table-top exercises related to countering WMD proliferation by government and non-government organizations.<br><br>***FY 2020 Plans:***<br>• Established full operational capability of the Counterproliferation Advanced Analytic Cell (CPAAC).<br>• Developed new prototypes to disable or defeat chemical and biological weapons under the U.S.-UK Foreign Chemical-Biological Weapons Elimination Industry Challenge.<br>• Developed and integrated technologies under a number of classified projects to enable new methods to detect, disrupt, and defeat WMD and WMD networks.<br>• Completed multiple research projects conducted by the National Defense University, the Naval Postgraduate School, the Center for Nonproliferation Studies, the University of Maryland, and the RAND Corporation. These projects yielded new insights into ways to address emerging technologies and WMD proliferation; development of concepts of operation and capabilities to counter WMD use by state adversaries; and open source methods and data to support nonproliferation.<br><br>***FY 2021 Plans:***<br>None. Funding eliminated by 2019 Defense Wide Review.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Decrease from FY 2020 to FY 2021 is the result of redistribution of funding from Countering Weapons of Mass Destruction (CWMD) Systems: Advanced Technology Development (PE# 0303310D8Z) to CWMD Systems: System Development and Demonstration (PE# 0305310D8Z) and CWMD Systems: Operational Systems Development (PE# 0607310D8Z) as part of the Defense Wide Review. This redistribution supports the Department's need to prioritize investment in fieldable capabilities to enhance Joint Force lethality in countering WMD proliferation and use. | | | |
| **Accomplishments/Planned Programs Subtotals** | 25.619 | 28.907 | 0.000 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

The Office of the Deputy Assistant Secretary of Defense for Threat Reduction and Arms Control (TRAC) establishes annual priorities based on national and DoD strategies and senior leader guidance. Based on those priorities, TRAC solicits project proposals from Combatant Commands, Military Services, and Defense Agencies, and interagency partners. To be selected, a proposed project must have a validated requirement, an engaged requirement champion, a viable acquisition strategy, and a

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 3 | **R-1 Program Element (Number/Name)**<br>PE 0303310D8Z / *Countering Weapons of Mass Destruction (CWMD) Systems: Advanced Technology Development* | **Project (Number/Name)**<br>004 / *CWMD Systems: Advanced Technology Development* |

qualified program management office. A technology project must identify its starting and desired end-state Technology Readiness Level. Likewise, the end-user for any proposed project must demonstrate a long-term plan for acceptance and sustainment of a fieldable capability. Project period of performance is typically 12-18 months.

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 4: *Advanced Component Development & Prototypes (ACD&P)* | **R-1 Program Element (Number/Name)**<br>PE 0603161D8Z *I Nuclear and Conventional Physical Security/Countering Nuclear Threats* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 269.462 | 27.123 | 42.695 | 32.636 | - | 32.636 | 32.130 | 32.003 | 32.073 | 32.825 | Continuing | Continuing |
| 162: *Nuclear and Conventional Physical Security* | 228.142 | 26.401 | 35.134 | 24.654 | - | 24.654 | 22.563 | 23.324 | 23.787 | 24.374 | Continuing | Continuing |
| 041: *CNT Prevention ADC&P* | 1.927 | 0.537 | 5.836 | 6.257 | - | 6.257 | 6.842 | 6.954 | 7.059 | 7.199 | Continuing | Continuing |
| 040: *National Technical Nuclear Forensics Systems* | 39.393 | 0.185 | 1.725 | 1.725 | - | 1.725 | 2.725 | 1.725 | 1.227 | 1.252 | Continuing | Continuing |

**Note**

Transferred $5.700 million each year through the FYDP from PE 0603161D8Z to 0605161D8Z to better align analytical work being done.

**A. Mission Description and Budget Item Justification**

This Program Element (PE) addresses the need to defend and deter against weapons of mass destruction threats and to safeguard personnel; prevent unauthorized access to equipment, installations, material, and documents; and to safeguard the foregoing against espionage, sabotage, damage, and theft. This program oversees advanced engineering development and rapid fielding throughout the DoD for an integrated and systemic approach for countering nuclear threats and the development of nuclear and conventional physical security material solutions. Public Law, Presidential and DoD-level guidance, and Combatant Command and Service requirements drive the priorities for these programs.

Under this PE, funding associated with nuclear and convention physical security material solution for the Department is broken down into seven capability areas: (1) Detection and Assessment; (2) Access Controls; (3) Installation and Transport Security; (4) Storage and Safeguards; (5) Prevention; (6) Decision Support Systems; and (7) Analytical Support. The material solutions either (a) lead to a Programs of Record transitioning to Program Element 0604161D8Z for Systems Development and Demonstration; (b) become technology insertions into existing programs; or (c) advance to being a certified Commercial/Government off-the-shelf product. The Physical Security Enterprise and Analysis Group is responsible for avoiding duplication of effort, ensuring systems integration, and promoting interoperability and sustainability.

DoD's laboratory capability is limited by capacity and technical expertise. In fiscal year (FY) 2018, Departments and Agencies began to shift research and development from NTNF to other mission areas. This resulted in degradation of the DoD's (and by default, the U.S. Government's) ability to execute the nuclear forensics mission and deter adversaries. Reemphasizing the importance of this mission is crucial to the success of this program.

This PE can fund travel to support the requirements of this program.

This appropriation will finance work, including staffing, performed by a government agency or by private individuals or organizations under a contractual or grant arrangement with the government who conduct research, development, and test and evaluation efforts.

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 4: *Advanced Component Development & Prototypes (ACD&P)* | **R-1 Program Element (Number/Name)**<br>PE 0603161D8Z *I Nuclear and Conventional Physical Security/Countering Nuclear Threats* |

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 28.076 | 42.695 | 44.047 | - | 44.047 |
| Current President's Budget | 27.123 | 42.695 | 32.636 | - | 32.636 |
| Total Adjustments | -0.953 | 0.000 | -11.411 | - | -11.411 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | -0.343 | - | | | |
| • SBIR/STTR Transfer | -0.605 | - | | | |
| • Fiscal Guidance | - | - | -2.240 | - | -2.240 |
| • Internal Realigning | - | - | -5.700 | - | -5.700 |
| • Cancelled Acct | -0.005 | - | - | - | - |
| • Economic Assumption | - | - | -0.038 | - | -0.038 |
| • Defense Wide Review Adjustment | - | - | -3.433 | - | -3.433 |

**Change Summary Explanation**

Shifted $5.7 million each year through the FYDP from PE 0603161D8Z to 0605161D8Z to better align analytical work being done. Additional reductions are to due to the Economic Assumption and the Defense Wide Review adjustment.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 4 | R-1 Program Element (Number/Name)<br>PE 0603161D8Z / *Nuclear and Conventional Physical Security/Countering Nuclear Threats* | Project (Number/Name)<br>162 / *Nuclear and Conventional Physical Security* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 162: *Nuclear and Conventional Physical Security* | 228.142 | 26.401 | 35.134 | 24.654 | - | 24.654 | 22.563 | 23.324 | 23.787 | 24.374 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

The Physical Security Enterprise & Analysis Program (PSEAP) conducts Technology and Engineering and Manufacturing Development throughout the Department of Defense for an integrated and systemic approach for nuclear and conventional physical security technology and systems. Priorities are driven by Combatant Command and Service requirements. This program is also addressing the Unmanned Systems threat by developing technology solutions that address the entire Kill Chain (Detect, Track, Identify, and Defeat) that are interoperable.

Funding associated with nuclear and convention physical security material solution for the Department is broken down into seven capability areas: (1) Detection and Assessment; (2) Access Controls; (3) Installation and Transport Security; (4) Storage and Safeguards; (5) Prevention; (6) Decision Support Systems; and (7) Analytical Support. The material solutions either (a) lead to a Programs of Record transitioning to Program Element 0604161D8Z for Systems Development and Demonstration; (b) become technology insertions into existing programs; or (c) advance to being a certified Commercial/Government off-the-shelf product. The Physical Security Enterprise and Analysis Group is responsible for avoiding duplication of effort, ensuring systems integration, and promoting interoperability and sustainability.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Detection and Assessment | 15.375 | 19.803 | 13.092 |
| ***Description:*** The ability to detect an adversary and assess their intentions is a basic physical security tenent. This capability area will design equipment to identify and warn of unauthorized access to a specified area or installation as well as equipment related to the notification and identification of explosive threats or hazards.<br><br>Accomplishment: The PSEAP and the National Nuclear Security Administration (NNSA) are jointly developing a Portable Intrusion Detection System (PIDS) that addresses similar needs to protect nuclear weapons and special nuclear material. PIDS will provide a stable sensor platform that maintains the integrity of an existing secure perimeter in the event of sensor maintenance or system downtime. These include, but are not limited to, scheduled maintenance and upgrade activities for extended periods of time, or during emergency situations requiring the establishment of a National Defense Area; and mission requirements that dictate deployment of nuclear certified assets to locations that do not meet nuclear security requirements.<br><br>***FY 2020 Plans:***<br>• Continue Trace Explosive Detection System Improvements | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0603161D8Z / *Nuclear and Conventional Physical Security/Countering Nuclear Threats* | **Project (Number/Name)**<br>162 / *Nuclear and Conventional Physical Security* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| • Continue evaluation of Colorimetric kits on bulk explosives and materials to evaluate the potential trace detection capabilities<br>• Continue Linear Sensor System Development for Maritime Threats<br>• Continue efforts on Joint Active Shooter Protection and Response<br>• Conduct an independent cyber assessment of the Sonardyne Sentinel Sonar sub-system to determine system vulnerabilities in order to fortify the physical security of USINDOPACOM's distributed basing strategy.<br>***FY 2021 Plans:***<br>• Complete integration of the PIDS suitable for Nuclear and Non-nuclear security requirements for the US Air Force and NNSA.<br>• Develop a system that produces high-quality underwater images enabling human assessment of underwater threats at ranges up to 70 feet.<br>• Develop an algorithm to automatically classify alarms to quickly present valid alarms and reduce the occurrences of invalid alarms and test in an operationally relevant waterside security environment.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Projects and project costs vary from year to year. | | | |
| ***Title:*** Access Controls | 4.812 | 6.321 | 4.954 |
| ***Description:*** Controlling access to safeguard personnel and their families and to prevent unauthorized access to critical infrastructure and materials is paramount. This capability area will focus on programs and processes related to the validity and verification of individuals entering or already within a facility.<br><br>Accomplishment: Defense Installation Access Control project enhances the Identity Matching Engine for Security & Analysis (IMESA) used at hundreds of DoD entry control points to compare Personal Identity Verification/Common Access Card holders against the National Crime Information Center and the Interstate Identification Index. Previous work developed a capability that compares DoD registered cardholders against the FBI's Wanted Persons File and against the Terrorist Screening Database. This capability prevents un-cleared people or potential terrorists from entering DoD installations. The upgraded system identified an individual with warrants for murder and aggravated assault with a deadly weapon trying to get installation access.<br>***FY 2020 Plans:***<br>• Continue system improvement on the IMESA capability to enhance the matching engine to compare cardholders against the Terrorist Screening Database.<br>***FY 2021 Plans:*** | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0603161D8Z / *Nuclear and Conventional Physical Security/Countering Nuclear Threats* | **Project (Number/Name)**<br>162 / *Nuclear and Conventional Physical Security* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| • Evaluate application of radio-frequency identification technology to rapidly detect Biological Select Agents and Toxins (BSAT) in packages exiting Army BSAT laboratories' entry control points and shipping areas without opening the containers.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Projects and project costs vary from year to year. | | | |
| ***Title:*** Installation and Transport Security<br><br>***Description:*** Robust installation and transport security are vital to preventing a weapon of mass destruction attack or the unauthorized access to key assets such as nuclear weapons and special nuclear material. This capability area will focus on programs and equipment intended to improve the physical security profile of fixed sites and facilities, as well as critical items while in-transit.<br><br>Accomplishment: Joint Active Shooter Protection and Response project will integrate sensors to automatically detect indoor gunshots; provides potential victims, responders and authorized personnel with information to enhance situational awareness; and enable automatic or manual control of the building - inhibiting the shooter - shortening the duration of an active shooter. US Military Academy agreed to be used as a test bed for this effort and the results have wide ranging potential to be incorporated into soft or high value facilities.<br><br>***FY 2020 Plans:***<br>• Continue to develop the Virtual Reality Synthetic Boat and Warning Shot Simulator to create a virtual version of the warning shot simulator training; that is lightweight, supplements the existing training, and provides remote anytime-anywhere refresher training .<br>• Continue design improvements and demonstrate a field-able stabilized crew-served heavy machine gun for naval applications.<br><br>***FY 2021 Plans:***<br>• Evaluate Automated Unmanned Ground Vehicle for Patrol & Security to enhance and augment manned security resources by providing pre-positioned and roving outdoor surveillance, security, safety, and routine/repeatable.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Projects and project costs vary from year to year. | 0.251 | 0.451 | 0.354 |
| ***Title:*** Storage and Safeguards<br><br>***Description:*** Properly securing critical assets to prevent access by unauthorized persons and implementing control measures that ensure access is limited to authorized persons is the foundation of physical security. This capability area will focus on equipment (e.g., locks, doors, etc.) designed to delay or stop unauthorized entry/access to a specified/localized area. | 0.000 | 0.500 | 0.500 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0603161D8Z / *Nuclear and Conventional Physical Security/Countering Nuclear Threats* | **Project (Number/Name)**<br>162 / *Nuclear and Conventional Physical Security* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Accomplishment: Develop a security container for aircraft use meeting customer-established metrics for system mass, dimension configuration, and environmental suitability. Integrate into a designated space on aircraft. Incorporate design features to meet customer-derived Concept of Operations and mission assurance metrics. Integrate design into existing aircraft configuration management and systems engineering concepts.<br><br>***FY 2020 Plans:***<br>• Continue to develop a security container for critical documents on aircraft.<br>***FY 2021 Plans:***<br>• Complete development of a security container for critical documents on aircraft through a concept demonstration.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Efforts can vary each year. | | | |
| ***Title:*** Prevention<br>***Description:*** The security procedures taken to discourage an adversary from accessing weapons of mass destruction or gaining unauthorized access to critical assets are at the heart of prevention. This capability area will focus on broad spectrum, generic efforts which have the ability to influence multiple areas.<br><br>Accomplishment: Increase Counter-Unmanned Aircraft System (C-UAS) capabilities and operator effectiveness at strategic locations within the DoD by integrating radar, electronic warfare, and camera sensor turret systems into common C2; installing physical passive defense barriers at critical locations; and expanding radar capabilities.<br><br>***FY 2020 Plans:***<br>• Integrate lighter-weight turret on the Joint Light Tactical Vehicle (JLTV) to reduce weight for a remote weapons station requirement the JLTV was not designed for to C-UAS.<br><br>• Integrate crew-served mount with Smart Shooter trigger interrupt and ballistic solution to the M240B to manually engage a small UAS by providing a kinetic solution to the kill chain.<br>***FY 2021 Plans:***<br>• Continue to integrate a lighter-weight turret on the Joint Light Tactical Vehicle (JLTV) to reduce weight for a remote weapons station requirement the JLTV was not designed for to Counter Unmanned Aircraft Systems | 2.166 | 2.916 | 2.385 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0603161D8Z / *Nuclear and Conventional Physical Security/Countering Nuclear Threats* | **Project (Number/Name)**<br>162 / *Nuclear and Conventional Physical Security* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| • Continue to integrate Crew-served mount with Smart Shooter trigger interrupt and ballistic solution to the M240B to manually engage a small UAS by providing a kinetic solution to the kill chain.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Projects and project costs vary from year to year. | | | |
| ***Title:*** Decision Support Systems<br>***Description:*** Decision support systems serve the management, operations, and planning levels of the DoD physical security enterprise to help to make decisions, which may be rapidly changing and not easily specified in advance. This capability area will focus on command and control equipment and projects related to the creation and enhancement of common operating pictures, and the establishment of common architectures / interface standards.<br><br>Accomplishment: Platform for Integrated Command, Control, and Communication and Responsive Defense project is developing the next generation security system using an open fusion annunciator, a secure cloud infrastructure and integration with a mobile Common Operating Picture, to create a cost-effective sensor platform. This capability will eventually replace antiquated security systems that are based on high cost sensor technology with low-cost sensors used in fields like the automotive industry.<br>***FY 2020 Plans:***<br>• Continue development of a full Cross Domain Solution that allows unclassified sensors to inter-operate with classified force protection command and control systems<br>***FY 2021 Plans:***<br>• Develop a capability to allow a user to see color images in night time by leveraging an electro-optical camera that is more cost effective than the commonly used infrared cameras.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Projects and project costs vary from year to year. | 2.660 | 3.551 | 2.721 |
| ***Title:*** Analytical Support<br>***Description:*** This capability area will focus on studies related to physical security topics and operational and management efforts related to day-to-day activities of the DoD Physical Security/Countering Nuclear Threats RDT&E Program.<br><br>Accomplishment: The Maritime Expeditionary & Transit Security project demonstrated and evaluated how advanced non-lethal weapons technology employed for extended range will enhance and improve response capabilities for the transit protection | 1.137 | 1.592 | 0.648 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0603161D8Z / *Nuclear and Conventional Physical Security/Countering Nuclear Threats* | **Project (Number/Name)**<br>162 / *Nuclear and Conventional Physical Security* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| mission. This project also determined how a flexible and scalable precision fire weapons system capability enhances/augments the current use of crew served weapons to counter fast approaching surface threats during High Value Unit transits.<br><br>***FY 2020 Plans:***<br>• Complete Force Protection Workload Reduction Video Analytics project that will automatically analyze video through the use of software to detect and determine events, while providing information related to the events taking place in real time.<br><br>***FY 2021 Plans:***<br>• Next Generation Electronic Security System project will identify new sensor technology for use in future security systems. Leverage industry (e.g. automotive and autonomous operations) to identify low cost solutions.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Projects and project costs vary from year to year. | | | |
| **Accomplishments/Planned Programs Subtotals** | 26.401 | 35.134 | 24.654 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 4 | R-1 Program Element (Number/Name)<br>PE 0603161D8Z / *Nuclear and Conventional Physical Security/Countering Nuclear Threats* | Project (Number/Name)<br>162 / *Nuclear and Conventional Physical Security* | |

**Product Development ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Prior Years - Closed Out Efforts | Various | Various : Various | 176.505 | - | | - | | - | | - | | - | - | - | - |
| Tactical Security System | MIPR | Multiple Performers : Multiple Locations | 2.350 | 1.995 | | 1.150 | | - | | - | | - | - | - | - |
| Linear Sensor System for Multi-Threat Detection | MIPR | Engineer Research and Development Center : Vicksburgs, MS | 2.450 | 1.320 | | - | | - | | - | | - | - | - | - |
| Portable Intrusion Detection System | MIPR | AFLCMC : Hanscom AFB, MA | 2.962 | 1.000 | | 1.000 | | - | | - | | - | - | - | - |
| Force Protection Pre-shot Sniper Detection Capability | TBD | Multiple Performers : Multiple Locations | 1.464 | 0.500 | | - | | - | | - | | - | - | - | - |
| WISP 2.0 | TBD | TBD : TBD | 1.616 | 1.000 | | - | | - | | - | | - | - | - | - |
| Defense Installation Access Control | TBD | TBD : TBD | 2.198 | 1.422 | | - | | - | | - | | - | - | - | - |
| Physical Security Enterprise Program | Various | Multiple Performers : Multiple Locations | 9.650 | 0.542 | | - | | 0.267 | | - | | 0.267 | - | - | - |
| Force Protection Cross Domain | MIPR | Multiple Performers : Multiple Locations | 1.408 | 1.400 | | - | | - | | - | | - | - | - | - |
| Force Protection Workload Reduction via Video Analytics | MIPR | Multiple Performers : Multiple Locations | 1.047 | 1.496 | | - | | - | | - | | - | - | - | - |
| Joint Active Shooter Protection and Response | MIPR | ARDEC : Picatinny Arsenal, NJ | 0.723 | 1.583 | | - | | - | | - | | - | - | - | - |
| Enhancing Biosecurity Surveillance using RFI Technology | MIPR | US Army Medical Research Institute of Infectious Diseases : Fort Detrick, MD | 0.287 | 0.559 | | - | | - | | - | | - | - | - | - |
| Enhanced Access Control for Husbanding Agencies using Biometrics | MIPR | Naval Surface Warfare Center, Dahlgren Division : Dahlgren, VA | 0.952 | 0.375 | | - | | - | | - | | - | - | - | - |

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 4 | R-1 Program Element (Number/Name)<br>PE 0603161D8Z / *Nuclear and Conventional Physical Security/Countering Nuclear Threats* | Project (Number/Name)<br>162 / *Nuclear and Conventional Physical Security* | |

**Product Development ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M2HB/M2A1 | MIPR | Naval Surface Warfare Center, Crane Division : Crane, IN | 0.400 | 0.750 | | - | | - | | - | | - | - | - | - |
| GunnAR for Waterside Security | MIPR | SPAWARSYSCEN Pacific : San Diego, CA | 0.700 | 0.300 | | - | | - | | - | | - | - | - | - |
| Virtual Reality Synthetic Boat and Warning Shot Simulator | MIPR | Multiple Performers : Multiple Locations | 0.416 | 0.423 | | 0.131 | | - | | - | | - | - | - | - |
| Automated Alarm Assessment | MIPR | Multiple Performers : Multiple Locations | - | 0.978 | | - | | - | | - | | - | - | - | - |
| Secure Tactical Communications Module | MIPR | Multiple Performers : Multiple Locations | - | 0.826 | | 0.798 | | - | | - | | - | - | - | - |
| Flexible Fire Control System | MIPR | Multiple Performers : Multiple Locations | - | 0.934 | | 1.400 | | - | | - | | - | - | - | - |
| Alert Attack Resistant Container | MIPR | Naval Facilities Engineering and Expeditionary Warfare Center : Port Hueneme, CA | 0.119 | 1.000 | | 0.500 | | - | | - | | - | - | - | - |
| Stabilized Crew-Served Heavy Machine Gun Mount | MIPR | NSWC : Crane, IN | - | - | | 0.614 | | - | | - | | - | - | - | - |
| Joint Expeditious Surface-Threat Sonar Capability | MIPR | TBD : TBD | - | - | | 1.499 | | 2.406 | | - | | 2.406 | Continuing | Continuing | - |
| Counter UAS Capability for DoD | MIPR | Various Performers : Various Locations | - | - | | 5.500 | | 5.500 | | - | | 5.500 | - | - | - |
| Wide Area Surveillance & Detection System with Light Detection and Ranging | MIPR | TBD : TBD | - | - | | 2.000 | | 1.000 | | - | | 1.000 | Continuing | Continuing | - |

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0603161D8Z / *Nuclear and Conventional Physical Security/Countering Nuclear Threats* | **Project (Number/Name)**<br>162 / *Nuclear and Conventional Physical Security* | |

**Product Development ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mobile Underwater Threat Imaging System | MIPR | TBD : TBD | - | - | | 0.860 | | 0.610 | | - | | 0.610 | Continuing | Continuing | - |
| Real-Time Video Enhancement Software | MIPR | TBD : TBD | - | - | | 1.200 | | 1.300 | | - | | 1.300 | Continuing | Continuing | - |
| Affordable Counter Small UAS Situational Awareness | MIPR | TBD : TBD | - | - | | 1.600 | | 1.400 | | - | | 1.400 | Continuing | Continuing | - |
| Handheld Force Protection Command and Control | MIPR | TBD : TBD | - | - | | 0.900 | | 1.200 | | - | | 1.200 | Continuing | Continuing | - |
| Light Detection and Ranging Change and Shape Detection | MIPR | TBD : TBD | - | - | | 1.500 | | 1.300 | | - | | 1.300 | Continuing | Continuing | - |
| Automated Unmanned Ground Vehicle for Patrol & Security | MIPR | TBD : TBD | - | - | | 0.600 | | 0.600 | | - | | 0.600 | Continuing | Continuing | - |
| Effective/Affordable Night Time Color Camera | MIPR | TBD : TBD | - | - | | 1.500 | | 1.300 | | - | | 1.300 | Continuing | Continuing | - |
| Marine Mammal Program/ Cooperative Vigilance | MIPR | TBD : TBD | - | - | | 0.747 | | 0.695 | | - | | 0.695 | Continuing | Continuing | - |
| Integrated Multi-Sensor Perimeter Awareness with Intelligent Light Detection and Ranging System of Systems | MIPR | TBD : TBD | - | - | | 0.850 | | 0.750 | | - | | 0.750 | Continuing | Continuing | - |
| Near-Shore Unified Tactical Response (NUTR) Battlefield Objective Navigation Display (BOND) | MIPR | TBD : TBD | - | - | | 0.300 | | 0.300 | | - | | 0.300 | Continuing | Continuing | - |
| Security Controlled Unmanned Aerial Airfield System | MIPR | TBD : TBD | - | - | | 0.840 | | 0.814 | | - | | 0.814 | Continuing | Continuing | - |

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0603161D8Z / *Nuclear and Conventional Physical Security/Countering Nuclear Threats* | **Project (Number/Name)**<br>162 / *Nuclear and Conventional Physical Security* | |

**Product Development ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Subtotal** | 205.247 | 18.403 | | 25.489 | | 19.442 | | - | | 19.442 | Continuing | Continuing | N/A |

**Support ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Prior Years Completed Efforts | Various | Various Performers : Various Locations | 3.236 | - | | - | | - | | - | | - | - | - | - |
| Nuclear Security Subject Matter Experts | MIPR | Applied Research Laboratories, The University of Texas : Austin, Texas | 1.145 | 0.225 | | 0.225 | | 0.225 | | - | | 0.225 | Continuing | Continuing | - |
| PSEAG Support | MIPR | Army Research Lab : Adelphi, MD | 0.536 | 0.600 | | - | | - | | - | | - | Continuing | Continuing | - |
| PSEAG Website and PSEAG SharePoint | MIPR | Army Research Lab : Adelphi, MD | 0.530 | 0.395 | | - | | - | | - | | - | Continuing | Continuing | - |
| Nuclear Matters Analytical Cell for Nuclear Deterrence | IA | DOE/Sandia National Laboratory : Albuquerque, NM | 1.500 | 1.500 | | 4.200 | | - | | - | | - | Continuing | Continuing | - |
| Nuclear Matters SIRC/ NDERG Support | Option/ T&M | SAIC : McLean, VA | 0.700 | 1.500 | | 0.166 | | - | | - | | - | Continuing | Continuing | - |
| Nuclear Matters Support | C/FFP | E3 Federal Solutions : Washington, DC | 0.053 | 0.086 | | - | | - | | - | | - | Continuing | Continuing | - |
| Nuclear Matters Technical Support | IA | Department of Health and Human Services : Bethesda, MD | 0.107 | 1.526 | | 1.500 | | - | | - | | - | Continuing | Continuing | - |
| PSEAG Support | MIPR | Air Force Civil Engineer Center : Tyndall AFB, FL | - | - | | 0.575 | | 0.575 | | - | | 0.575 | Continuing | Continuing | - |

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0603161D8Z / *Nuclear and Conventional Physical Security/Countering Nuclear Threats* | **Project (Number/Name)**<br>162 / *Nuclear and Conventional Physical Security* |

**Support ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Nuclear Matters/PSEAG Support | MIPR | TBD : TBD | - | - | | - | | 1.762 | | - | | 1.762 | Continuing | Continuing | - |
| DoD Electronic Security System Analysis | MIPR | Office of Naval Reserach : TBD | - | - | | 0.450 | | - | | - | | - | Continuing | Continuing | - |
| | | **Subtotal** | 7.807 | 5.832 | | 7.116 | | 2.562 | | - | | 2.562 | Continuing | Continuing | N/A |

**Remarks**

NA

**Test and Evaluation ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Prior Years Completed Efforts | Various | Multiple Performers : Multiple Locations | 2.799 | - | | - | | - | | - | | - | Continuing | Continuing | - |
| Aerial Physical Security Assessment | MIPR | SPAWARSYSCEN Atlantic : Charlston, SC | 0.595 | 0.433 | | - | | - | | - | | - | Continuing | Continuing | - |
| Joint Assessment of Nefarious Swimmer System | MIPR | Multiple Performers : Multiple Locations | 0.975 | 1.267 | | - | | - | | - | | - | Continuing | Continuing | - |
| Greyscan T&E | MIPR | NSWC IHEODTD : Indian Head, MD | - | 0.371 | | - | | - | | - | | - | - | - | - |
| C-UAS in the Homeland | MIPR | Mulitple Performers : Various Locations | 4.247 | - | | - | | - | | - | | - | Continuing | Continuing | - |
| Test & Evaluation Oversight | MIPR | SPAWARSYSCEN Atlantic : Charleston, SC | - | - | | 0.125 | | 0.125 | | - | | 0.125 | Continuing | Continuing | - |
| Counter Intrusion / Counter Unmanned Aircraft System | MIPR | Defense Technical Information Center - Various Performers : Various Locations | - | - | | 0.500 | | 0.500 | | - | | 0.500 | Continuing | Continuing | - |

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0603161D8Z / *Nuclear and Conventional Physical Security/Countering Nuclear Threats* | **Project (Number/Name)**<br>162 / *Nuclear and Conventional Physical Security* |

**Test and Evaluation ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Development, Test and Evaluation of an Electronic Security Systems Information Management System | MIPR | TBD : TBD | - | - | | 0.690 | | 0.750 | | - | | 0.750 | Continuing | Continuing | - |
| Electronic Harbor Security System-Sensor Track Fusion | MIPR | Applied Research Laboratory/Univerity of Texas (Through NAVSEA) : Austin, TX | - | - | | 0.750 | | 0.300 | | - | | 0.300 | Continuing | Continuing | - |
| Next Generation Electronic Security System | MIPR | NIWC-LANT : Charleston, SC | - | - | | - | | 0.700 | | - | | 0.700 | Continuing | Continuing | - |
| | | **Subtotal** | 8.616 | 2.071 | | 2.065 | | 2.375 | | - | | 2.375 | Continuing | Continuing | N/A |

**Remarks**

NA

**Management Services ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Prior Years - Completed Efforts | Various | Multiple Performers : Multiple Locations | 5.071 | - | | - | | - | | - | | - | Continuing | Continuing | - |
| Detection & Assessment IPT | MIPR | AF Security Forces Center : Lackland AFB, TX | 1.401 | 0.095 | | - | | - | | - | | - | - | - | - |
| Management Services | TBD | Multiple Performers : Multiple Locations | - | - | | 0.464 | | 0.275 | | - | | 0.275 | Continuing | Continuing | - |
| | | **Subtotal** | 6.472 | 0.095 | | 0.464 | | 0.275 | | - | | 0.275 | Continuing | Continuing | N/A |

**Remarks**

NA

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 4 | R-1 Program Element (Number/Name)<br>PE 0603161D8Z / *Nuclear and Conventional Physical Security/Countering Nuclear Threats* | Project (Number/Name)<br>162 / *Nuclear and Conventional Physical Security* | |

| | Prior Years | FY 2019 | | FY 2020 | | FY 2021 Base | | FY 2021 OCO | | FY 2021 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | 228.142 | 26.401 | | 35.134 | | 24.654 | | - | | 24.654 | Continuing | Continuing | N/A |

**Remarks**

NA

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0603161D8Z / *Nuclear and Conventional Physical Security/Countering Nuclear Threats* | **Project (Number/Name)**<br>162 / *Nuclear and Conventional Physical Security* |

| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0603161D8Z / *Nuclear and Conventional Physical Security/Countering Nuclear Threats* | **Project (Number/Name)**<br>162 / *Nuclear and Conventional Physical Security* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***Detection & Assessment*** | | | | |
| Detection & Assessment | 1 | 2012 | 4 | 2025 |
| ***Decision Support*** | | | | |
| Decision Support | 1 | 2012 | 4 | 2025 |
| ***Storage & Safeguards*** | | | | |
| Storage & Safeguards | 1 | 2012 | 4 | 2025 |
| ***Installation & Transport Security*** | | | | |
| Installation & Transport Security | 1 | 2012 | 4 | 2025 |
| ***Prevention*** | | | | |
| Prevention | 1 | 2012 | 4 | 2025 |
| ***Access Control*** | | | | |
| Access Control | 1 | 2012 | 4 | 2025 |
| ***Analytical Support*** | | | | |
| Analytical Support | 1 | 2012 | 4 | 2025 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 4 | R-1 Program Element (Number/Name)<br>PE 0603161D8Z / *Nuclear and Conventional Physical Security/Countering Nuclear Threats* | Project (Number/Name)<br>041 / *CNT Prevention ADC&P* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 041: *CNT Prevention ADC&P* | 1.927 | 0.537 | 5.836 | 6.257 | - | 6.257 | 6.842 | 6.954 | 7.059 | 7.199 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

The Countering Nuclear Threats (CNT) Program is the integrated and layered program across the full range of the Department of Defense (DoD) to prevent, detect, respond to, and recover from radiological or nuclear (RN) incidents delivered through unconventional means, regardless of origin. It is also the only DoD Budget Activity 4 RDT&E Program Element focused on improving CNT capabilities which addresses capability gaps identified by the Services, Combatant Commands, and the Joint Staff. These capabilities are necessary for the DoD to plan and execute effective operations against rogue regimes that pursue nuclear weapons.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Countering Nuclear Threats | 0.537 | 5.836 | 6.257 |

***Description:*** CNT supported advanced development of Joint RN passive and active defense systems. Specifically, the joint Radioisotope Identification Devices (RIIDs) program will provide DoD forces with a modernized capability to identify radioisotopes in the field. This capability is necessary for missions to prevent use of radiological & nuclear weapons, safeguard the force, and manage the consequences of an inadvertent or intentional release of RN materials. RIIDs will replace obsolescent systems with modern systems that have enhanced capabilities with improved interoperability.

***FY 2020 Plans:***

- Complete investment in RIIDs, which supports Service procurement starting in FY21 to replace obsolescent equipment with improved capabilities.

- Advanced development of improved DoD capabilities that will enable DoD to maintain a competitive edge over proliferating nations through the early identification of illicit activities to enable operations to be planned against nations proliferating to deny the acquisition of nuclear materials and weapons. Specifically:
-- Project that develops a capability to identify previously undetectable uranium production facilities through the operationalization of new techniques that lower existing detection thresholds, enable Combatant Commands (CCMDs) detection of adversary activities in their area of responsibility, and support CNT planning.
-- Project that develops a new capability that utilizes innovative means that will enable CCMD's to maintain awareness of State-level nuclear activities. This project is focused on National Defense Strategy priorities but has potential global applications.

***FY 2021 Plans:***

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0603161D8Z / *Nuclear and Conventional Physical Security/Countering Nuclear Threats* | **Project (Number/Name)**<br>041 / *CNT Prevention ADC&P* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| - Continue the advanced development of improved DoD capabilities that will enable a competitive edge over proliferating nations through the early identification of illicit activities and deny the acquisition of nuclear materials and weapons. Specifically:<br>-- Continue development of a project that develops a capability to identify previously undetectable uranium production facilities through the operationalization of new techniques that lower existing detection thresholds, enable CCMD detection of adversary activities in their area of responsibility, and support CNT planning.<br>-- Continue development of a project that develops a new capability that utilizes innovative means that will enable CCMD's to maintain awareness of State-level nuclear activities. This project is focused on National Defense Strategy priorities but has potential global applications.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Projects and project costs vary from year to year | | | |
| **Accomplishments/Planned Programs Subtotals** | 0.537 | 5.836 | 6.257 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0603161D8Z / *Nuclear and Conventional Physical Security/Countering Nuclear Threats* | **Project (Number/Name)**<br>041 / *CNT Prevention ADC&P* | |

**Product Development ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Radioisotope Identification Device | MIPR | JPEO CBD : Aberdeen, MD. | - | 0.537 | | - | | - | | - | | - | - | - | - |
| Radiological Detection System | Sub Allot | JPEO CBD : Aberdeen, MD. | 1.927 | - | | - | | - | | - | | - | - | - | - |
| Active Prevention System | MIPR | Air Force Technical Applications Center : Patrick AFB, Florida | - | - | | 2.736 | | 2.715 | | - | | 2.715 | Continuing | Continuing | - |
| Active Prevention System | Various | TBD : TBD | - | - | | 2.500 | | 2.942 | | - | | 2.942 | Continuing | Continuing | - |
| | | **Subtotal** | 1.927 | 0.537 | | 5.236 | | 5.657 | | - | | 5.657 | Continuing | Continuing | N/A |

**Remarks**

NA

**Support ($ in Millions)**

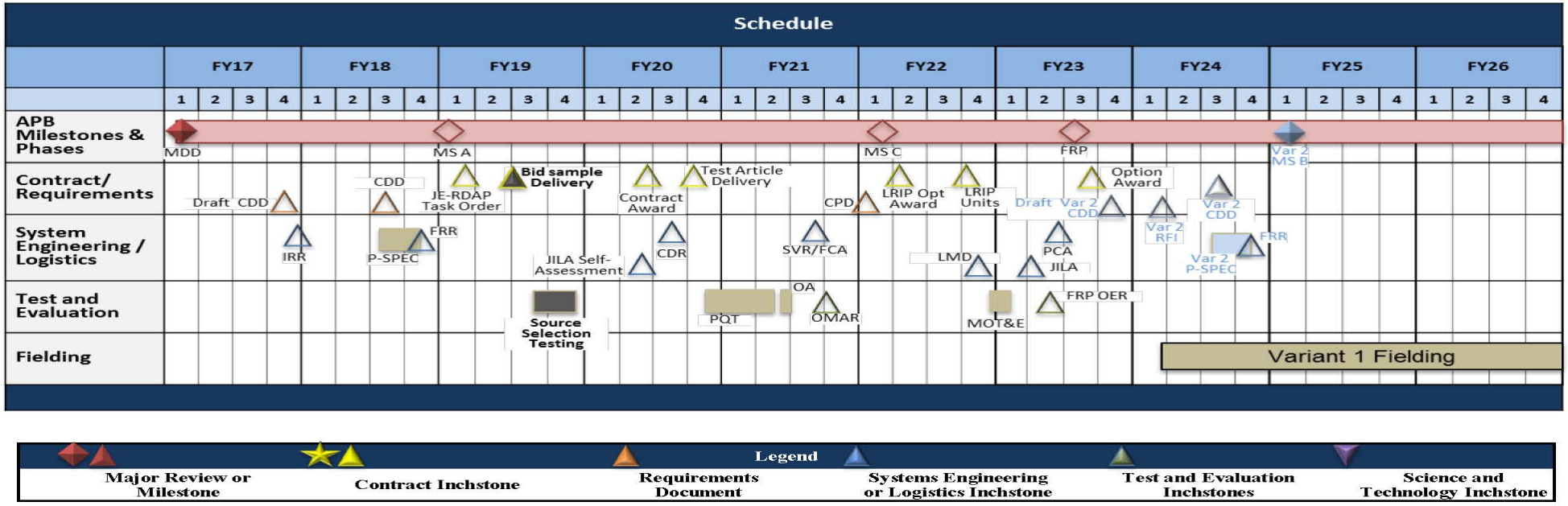
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| INTERPOL | IA | DoE National Nuclear Security Administration : Las Vegas, Nevada | - | - | | 0.600 | | 0.600 | | - | | 0.600 | Continuing | Continuing | - |
| | | **Subtotal** | - | - | | 0.600 | | 0.600 | | - | | 0.600 | Continuing | Continuing | N/A |

| | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | 1.927 | 0.537 | | 5.836 | | 6.257 | | - | | 6.257 | Continuing | Continuing | N/A |

**Remarks**

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0603161D8Z / *Nuclear and Conventional Physical Security/Countering Nuclear Threats* | **Project (Number/Name)**<br>041 / *CNT Prevention ADC&P* |

## Radioisotope Identification Device



| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0603161D8Z / *Nuclear and Conventional Physical Security/Countering Nuclear Threats* | **Project (Number/Name)**<br>041 / *CNT Prevention ADC&P* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***Radioisotope Identification Device*** | | | | |
| Radioisotope Identification Device | 1 | 2018 | 4 | 2019 |
| ***Active Prevention System*** | | | | |
| Active Prevention System | 1 | 2020 | 4 | 2024 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 4 | R-1 Program Element (Number/Name)<br>PE 0603161D8Z / *Nuclear and Conventional Physical Security/Countering Nuclear Threats* | Project (Number/Name)<br>040 / *National Technical Nuclear Forensics Systems* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 040: *National Technical Nuclear Forensics Systems* | 39.393 | 0.185 | 1.725 | 1.725 | - | 1.725 | 2.725 | 1.725 | 1.227 | 1.252 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

National Technical Nuclear Forensics (NTNF) is the only Department of Defense (DoD) program focused on advanced development of new capabilities that support the U.S. Government's ability to deter adversaries through our ability to attribute the use or attempted use of nuclear weapons or the source of any nuclear or radiological attack.

The ability to identify the source of nuclear material from radioactive debris is critical to our national defense and security. Swift and accurate forensic and attribution (identification) capabilities are vital to supporting the President and Secretary of Defense in developing an appropriate national response to a nuclear event and to prevent future attacks in a timely manner.

An effective attribution capability provides the United States (U.S.) Government deterrent against nations who may use proxies or other non-traditional delivery of nuclear weapons against the U.S., U.S. interests, or allies. Additionally, this program sustains perishable U.S. technical expertise at the operational DoD laboratories required to respond to a post-detonation NTNF event.

DoD's laboratory capability is limited by capacity and technical expertise. In fiscal year (FY) 2018, Departments and Agencies began to shift research and development from NTNF to other mission areas. This resulted in degradation of the DoD's (and by default, the U.S. Government's) ability to execute the nuclear forensics mission and deter adversaries. Reemphasizing the importance of this mission is crucial to the success of this program.

This PE can fund travel to support the requirements of this program.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** NTNF Capability Development | 0.185 | 1.725 | 1.725 |
| ***Description:*** The development of the Harvester Particulate Collection System is a modular pod that attaches to manned and unmanned aircraft to collect particulate airborne samples. The Modular Whole Air Collection System provides a complimentary, modular capability to collect air samples. Both of these projects are being leveraged by the Air Force Fleet Modernization initiative started in FY 2019. | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0603161D8Z / *Nuclear and Conventional Physical Security/Countering Nuclear Threats* | **Project (Number/Name)**<br>040 / *National Technical Nuclear Forensics Systems* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| The United States Prompt Diagnostics System is a ground-based sensor solution that significantly enhances detection of prompt nuclear detonation signals in urban environments. The system transferred to the Air Force in FY 2019 and is currently undergoing an operational and readiness review.<br><br>***FY 2020 Plans:***<br>- Advanced development of passive capability to address prompt detection gaps identified by the Joint Staff and independent analysis by the National Academy of Sciences. A passive detection system will enable persistent monitoring of a considerably expanded geographic footprint at a significantly reduced cost when compared to current systems.<br>- Advanced development of new DoD NTNF laboratory capabilities, through implementing new analytical techniques and leveraging emerging technologies and methods, which will decrease the time to develop high confidence results by a multiple of weeks. These projects also sustain perishable technical expertise necessary for DoD to accomplish the post-detonation NTNF mission. Laboratory improvement projects include:<br>- Integration of R&D methods to improve existing radiochemistry flowsheets to reduce timelines and recover additional isotopes.<br>- Developing tools to integrate data from multiple, disparate sources and streamline analyses to decrease the time required to report conclusions to decision makers to support attribution.<br><br>***FY 2021 Plans:***<br>- Continue to advance the development of passive capability to address prompt detection gaps.<br>- Continue to advance development of new DoD NTNF laboratory capabilities and improved DoD collection capabilities to shorten timelines and improve confidence levels in reporting to national level decision makers.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>N/A | | | |
| **Accomplishments/Planned Programs Subtotals** | 0.185 | 1.725 | 1.725 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0603161D8Z / *Nuclear and Conventional Physical Security/Countering Nuclear Threats* | **Project (Number/Name)**<br>040 / *National Technical Nuclear Forensics Systems* | |

**Product Development ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| National Nuclear Technical Forensics Product Development - Prior Years | Various | Multiple Performers : Multiple Locations | 38.651 | - | | - | | - | | - | | - | Continuing | Continuing | - |
| AFTAC AFIDS | MIPR | Air Force Technical Applications Center : Patrick AFB, Florida | - | - | | 1.500 | | 1.500 | | - | | 1.500 | Continuing | Continuing | - |
| | | **Subtotal** | 38.651 | - | | 1.500 | | 1.500 | | - | | 1.500 | Continuing | Continuing | N/A |

**Remarks**

NA

**Support ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Nuclear Forensics Travel Support | MIPR | Air Force Technical Applications Center : Patrick AFB, Florida | - | 0.030 | | 0.030 | | 0.030 | | - | | 0.030 | Continuing | Continuing | - |
| | | **Subtotal** | - | 0.030 | | 0.030 | | 0.030 | | - | | 0.030 | Continuing | Continuing | N/A |

**Management Services ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| National Nuclear Technical Forensics Management Services- Prior Years | Various | Multiple Performers : Multiple Locations | 0.093 | - | | - | | - | | - | | - | Continuing | Continuing | - |
| Nuclear Testing, Diagnostics, Forensics and Stockpile Stewardship Course | IA | DOE : Livermore, CA | 0.649 | 0.155 | | 0.195 | | 0.195 | | - | | 0.195 | Continuing | Continuing | - |

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 4 | R-1 Program Element (Number/Name)<br>PE 0603161D8Z / *Nuclear and Conventional Physical Security/Countering Nuclear Threats* | Project (Number/Name)<br>040 / *National Technical Nuclear Forensics Systems* | |

**Management Services ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Subtotal | | | 0.742 | 0.155 | | 0.195 | | 0.195 | | - | | 0.195 | Continuing | Continuing | N/A |

**Remarks**

NA

| | Prior Years | FY 2019 | | FY 2020 | | FY 2021 Base | | FY 2021 OCO | | FY 2021 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Project Cost Totals | 39.393 | 0.185 | | 1.725 | | 1.725 | | - | | 1.725 | Continuing | Continuing | N/A |

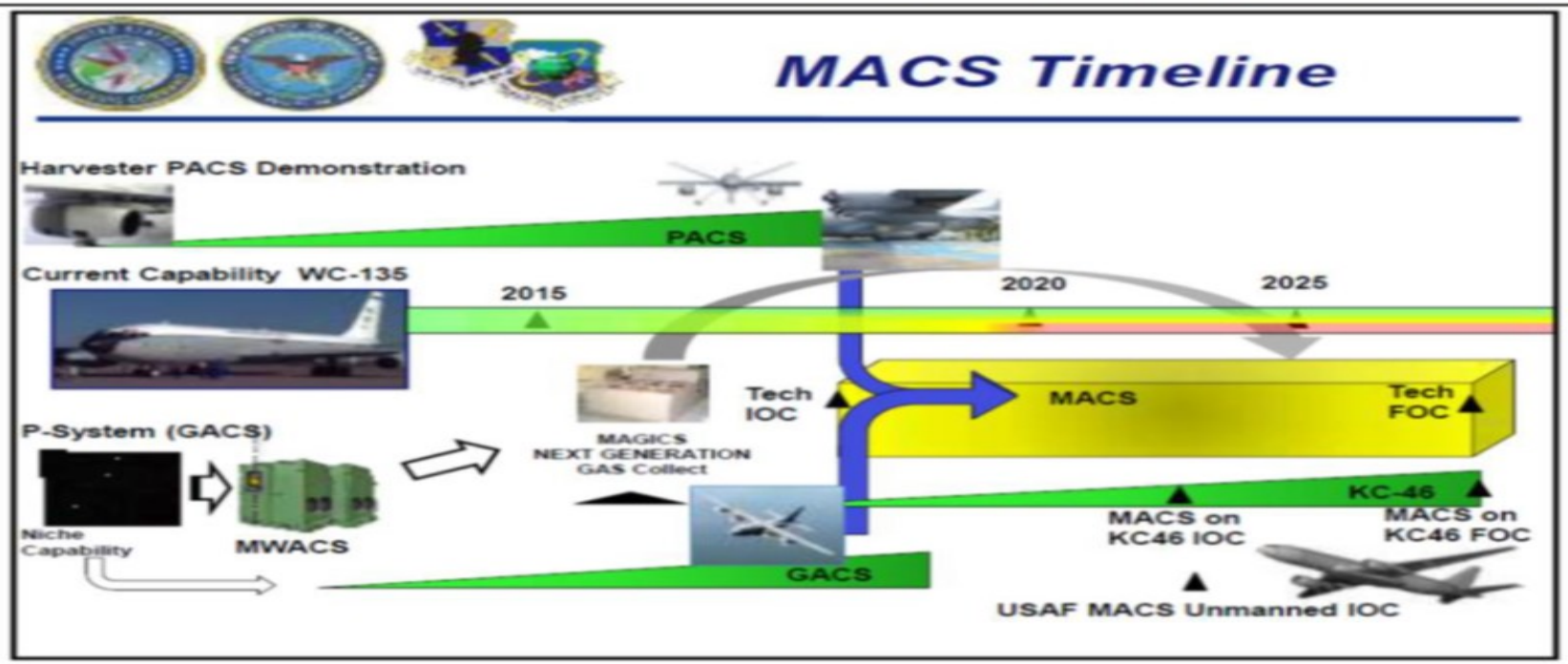
**Remarks**

NA

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0603161D8Z / *Nuclear and Conventional Physical Security/Countering Nuclear Threats* | **Project (Number/Name)**<br>040 / *National Technical Nuclear Forensics Systems* |

## Harvester Particulate Airborne Collection System & Modular Whole-air Collection System

### Particulate Airborne Collection System and Modular Whole-air Collection System Timeline



| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0603161D8Z / *Nuclear and Conventional Physical Security/Countering Nuclear Threats* | **Project (Number/Name)**<br>040 / *National Technical Nuclear Forensics Systems* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***Nuclear Testing, Diagnostics, Forensics and Stockpile Stewardship Course*** | | | | |
| Nuclear Testing, Diagnostics, Forensics and Stockpile Stewardship Course | 1 | 2018 | 4 | 2025 |
| ***AFTAC AFIDS*** | | | | |
| AFTAC AFIDS | 4 | 2020 | 3 | 2025 |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 4: *Advanced Component Development & Prototypes (ACD&P)* | **R-1 Program Element (Number/Name)**<br>PE 0603600D8Z / *WALKOFF* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 194.958 | 89.376 | 92.791 | 106.529 | - | 106.529 | 108.652 | 112.380 | 114.254 | 116.953 | Continuing | Continuing |
| 600: *WALKOFF* | 194.958 | 89.376 | 92.791 | 106.529 | - | 106.529 | 108.652 | 112.380 | 114.254 | 116.953 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

Classified

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 92.012 | 92.791 | 94.589 | - | 94.589 |
| Current President's Budget | 89.376 | 92.791 | 106.529 | - | 106.529 |
| Total Adjustments | -2.636 | 0.000 | 11.940 | - | 11.940 |
| • Congressional General Reductions | 0.000 | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | -2.620 | - | | | |
| • Departmental Adjustment | -0.016 | - | 11.940 | - | 11.940 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 4 | R-1 Program Element (Number/Name)<br>PE 0603600D8Z / *WALKOFF* | Project (Number/Name)<br>600 / *WALKOFF* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 600: *WALKOFF* | 194.958 | 89.376 | 92.791 | 106.529 | - | 106.529 | 108.652 | 112.380 | 114.254 | 116.953 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

Classified.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** WALKOFF | 89.376 | 92.791 | 106.529 |
| ***Description:*** Classified.<br><br>***FY 2020 Plans:***<br>Classified<br><br>***FY 2021 Plans:***<br>Classified<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Classified. | | | |
| **Accomplishments/Planned Programs Subtotals** | 89.376 | 92.791 | 106.529 |

**C. Other Program Funding Summary ($ in Millions)**

| Line Item | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|
| • 0603600D8Z O&M DW: *WALKOFF* | 3.914 | 4.186 | 4.233 | - | 4.233 | 4.290 | 4.342 | 4.682 | 4.993 | Continuing | Continuing |

**Remarks**

**D. Acquisition Strategy**

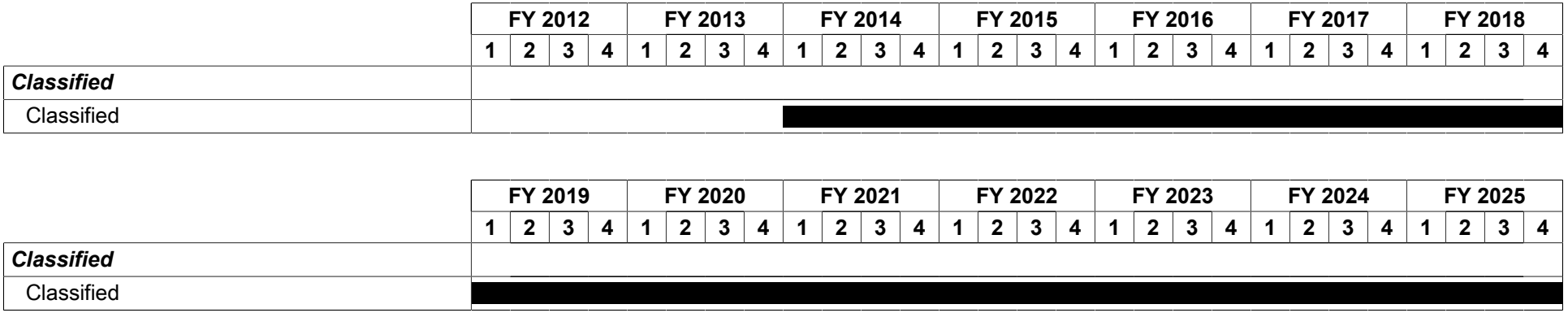
Classified.

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0603600D8Z / *WALKOFF* | **Project (Number/Name)**<br>600 / *WALKOFF* |

**Remarks**

Classified.

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0603600D8Z / *WALKOFF* | **Project (Number/Name)**<br>600 / *WALKOFF* |



| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0603600D8Z / *WALKOFF* | **Project (Number/Name)**<br>600 / *WALKOFF* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***Classified*** | | | | |
| Classified | 1 | 2014 | 4 | 2025 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 4: *Advanced Component Development & Prototypes (ACD&P)* | **R-1 Program Element (Number/Name)**<br>PE 0603821D8Z / *Acquisition Enterprise Data & Information Services* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 3.955 | 2.500 | 5.659 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| 840: *Acquisition Enterprise Data & Information Services* | 3.955 | 2.500 | 5.659 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**Note**

FY 2021 - FY 2025 funding was transferred to BA 8, PE 0608648D8Z, in support of the Software and Digital Technology Pilot Program.

**A. Mission Description and Budget Item Justification**

The Acquisition Enterprise Data & Information Services (AEDIS) investment supports enhanced Acquisition Visibility (AV) including information and analytics for the Defense Acquisition Executive (DAE), Component Acquisition Executives (CAE), Service Chiefs of Staff, OSD senior leaders, Program Managers and Program Executive Offices, and OSD and Component analysts who assess the efficiency and effectiveness of acquiring and sustaining the Department's acquisition programs including Defense Acquisition Programs, Portfolios, and Investments; Acquisition Category (ACAT) I – IV programs; and Middle Tier of Acquisition. AEDIS/AV supports DAE, CAE, and Service Chief responsibilities by providing critical information for acquisition analysis, oversight, and decisions. AEDIS/AV institutionalizes the management of data, business rules, and analytics used in the Department's acquisition decision making. It integrates the acquisition data stored across multiple disparate Federal and Departmental organizations' data sets and systems. The AEDIS/AV investment delivers the Department's sole authoritative data source for acquisition information and tools, including the Defense Acquisition Visibility Environment (DAVE), enables acquisition data analysis capabilities, and provides data access services and data standards via the Acquisition Visibility Data Matrix (AVDM). Funding supports enhancements to Acquisition Visibility through the definition, development, and fielding of concepts and tools to enable Department-wide data analysis for use across the Department and Congress.

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 4: *Advanced Component Development & Prototypes (ACD&P)* | **R-1 Program Element (Number/Name)**<br>PE 0603821D8Z / *Acquisition Enterprise Data & Information Services* |

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 2.500 | 5.659 | 6.527 | - | 6.527 |
| Current President's Budget | 2.500 | 5.659 | 0.000 | - | 0.000 |
| Total Adjustments | 0.000 | 0.000 | -6.527 | - | -6.527 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | - | - | | | |
| • Internal Re-alignment of Funds to BA 8, PE 0608648D8Z, Software and Digital Technology Pilot Program | - | - | -6.176 | - | -6.176 |
| • Defense Wide Review Adjustment | - | - | -0.351 | - | -0.351 |

**Change Summary Explanation**

As a result of the FY 2021 Defense Wide Review (DWR) this program was reduced by $0.351 million dollars. The DWR focused on the Secretary's guidance to streamline operations, increase efficiency, and promote greater affordability within the OSD and Defense Agencies and Field Activities in order to ensure the Department's optimum alignment to the National Defense Strategy and DoD strategic guidance, with particular focus on building a more lethal, resilient, agile, and ready force while strengthening alliances, prioritizing cyber and space capabilities, and focusing on innovation to maintain the technological advantage."

An additional re-alignment of funds in the amount of $6.176 million dollars was transferred to BA 8, PE 0608648D8Z, in support of the Software and Digital Technology Pilot Program.

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Acquisition Enterprise Data & Information Services | 2.500 | 5.659 | 0.000 |
| ***Description:*** Acquisition Enterprise Data & Information Services investments enhance the visibility of the Department's acquisition programs for the DAE, CAEs, Service Chiefs of Staff, OSD senior leaders, and OSD and Component analysts. | | | |
| ***FY 2020 Plans:***<br>Plans include continued development and prototyping of legacy capabilities transitioning to DAVE and development and prototyping of new acquisition visibility capabilities and applications to improve analysis and decision-making including Acquisition Program Baselines, and a SIPRNet acquisition data Analytic Layer. | | | |
| ***FY 2021 Plans:*** | | | |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 4: *Advanced Component Development & Prototypes (ACD&P)* | **R-1 Program Element (Number/Name)**<br>PE 0603821D8Z / *Acquisition Enterprise Data & Information Services* |

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| FY 2021 - FY 2025 was transferred to BA 8, PE 0608648D8Z, Software and Digital Technology Pilot Program.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>As a result of the FY 2021 Defense Wide Review this program was reduced by $0.351 million dollars. In FY 2021 - FY 2025 an additional re-alignment of funds in the amount of $6.176 million dollars was transferred to BA 8, PE 0608648D8Z in support of the Software and Digital Technology Pilot Program. | | | |
| ***Title:*** FY 2019 Accomplishments/Planned Programs<br><br>***Description:*** Provided authoritative acquisition data. Published raw data and develop data capabilities in DAVE, based on an Application Program Interface (API)-first model, including:<br>- Official Program List<br>- Prime/Sub-Contractor Data Set (quarterly)<br>- Selected Acquisition Review (SAR) Data Set<br>- Official Nunn-McCurdy Breach List<br>Delivered NC3-covered acquisition portfolio management capabilities<br>Delivered Rapid Prototyping and Rapid Fielding (Middle Tier of Acquisition) Reporting capability<br>Integrated AVDM into the Acquisition Information Repository (AIR)<br>Delivered the Army's 'Should Cost' Application | 0.000 | - | - |
| **Accomplishments/Planned Programs Subtotals** | 2.500 | 5.659 | 0.000 |

**D. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**E. Acquisition Strategy**

Development and prototyping is acquired through a combination of competed small-disadvantaged business and small business contracts.

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0603821D8Z / *Acquisition Enterprise Data & Information Services* | **Project (Number/Name)**<br>840 / *Acquisition Enterprise Data & Information Services* |

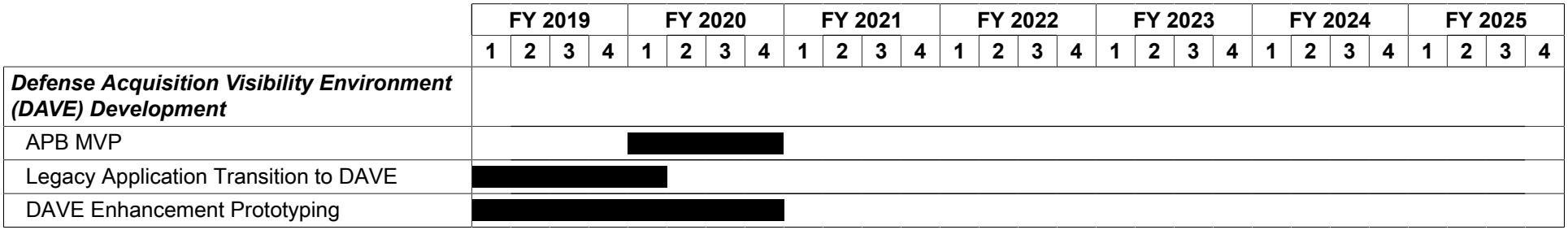
**Product Development ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAVE Development | Option/ FFP | Contractor : Contractor Facility | 3.955 | 2.500 | Jul 2019 | 2.552 | Jul 2020 | 0.000 | Jul 2021 | 0.000 | | 0.000 | 0.000 | 9.007 | 9.007 |
| Parallel DAVE Effort | C/BPA | Contractor : Contractor Facility | 0.000 | 0.000 | | 3.107 | Mar 2020 | 0.000 | Mar 2021 | - | | 0.000 | 0.000 | 3.107 | 3.107 |
| | | **Subtotal** | 3.955 | 2.500 | | 5.659 | | 0.000 | | 0.000 | | 0.000 | 0.000 | 12.114 | N/A |

| | Prior Years | FY 2019 | | FY 2020 | | FY 2021 Base | | FY 2021 OCO | | FY 2021 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | 3.955 | 2.500 | | 5.659 | | 0.000 | | 0.000 | | 0.000 | 0.000 | 12.114 | N/A |

**Remarks**

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0603821D8Z / *Acquisition Enterprise Data & Information Services* | **Project (Number/Name)**<br>840 / *Acquisition Enterprise Data & Information Services* |



| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0603821D8Z / *Acquisition Enterprise Data & Information Services* | **Project (Number/Name)**<br>840 / *Acquisition Enterprise Data & Information Services* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***Defense Acquisition Visibility Environment (DAVE) Development*** | | | | |
| APB MVP | 1 | 2020 | 4 | 2020 |
| Legacy Application Transition to DAVE | 1 | 2019 | 1 | 2020 |
| DAVE Enhancement Prototyping | 1 | 2019 | 4 | 2020 |

**Note**

FY 2021 - FY 2025 was transferred to BA 8, PE 0608648D8Z, Software and Digital Technology Pilot Program.

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 4: *Advanced Component Development & Prototypes (ACD&P)* | **R-1 Program Element (Number/Name)**<br>PE 0603851D8Z *I Environmental Security Technology Certification Program (ESTCP)* |

| COST ($ in Millions) | Prior Years (+) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 420.186 | 41.058 | 68.572 | 61.345 | - | 61.345 | 57.178 | 57.162 | 58.011 | 59.202 | Continuing | Continuing |
| 514: *Environmental Security Technology Certification Program* | 414.186 | 41.058 | 68.572 | 61.345 | - | 61.345 | 57.178 | 57.162 | 58.011 | 59.202 | Continuing | Continuing |

(+) The sum of all Prior Years is $6.000 million less than the represented total due to several projects ending

**A. Mission Description and Budget Item Justification**

The Environmental Security Technology Certification Program (ESTCP) demonstrates and validates promising and innovative environmental and energy technologies that targets the Department of Defense (DoD) most urgent needs. Technologies selected are projected to provide a return on the investment through cost savings and improved efficiencies. The program responds to: (1) Congressional concern over the slow pace of remediation of environmentally polluted sites on military installations, (2) Congressional direction to conduct demonstrations specifically focused on emerging new technologies, and (3) the need to improve defense readiness by reducing the drain on the Department's operation and maintenance dollars caused by environmental restoration, waste management, and the cost of energy. Preference for demonstrations is given to technologies that have successfully completed all necessary research and development objectives, and address the highest priority DoD requirements.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 41.925 | 66.572 | 64.282 | - | 64.282 |
| Current President's Budget | 41.058 | 68.572 | 61.345 | - | 61.345 |
| Total Adjustments | -0.867 | 2.000 | -2.937 | - | -2.937 |
| • Congressional General Reductions | 0.000 | - | | | |
| • Congressional Directed Reductions | 0.000 | - | | | |
| • Congressional Rescissions | 0.000 | - | | | |
| • Congressional Adds | 0.000 | 2.000 | | | |
| • Congressional Directed Transfers | 0.000 | - | | | |
| • Reprogrammings | 0.000 | - | | | |
| • SBIR/STTR Transfer | -0.860 | - | | | |
| • Other Program Adjustments | 0.000 | - | -0.292 | - | -0.292 |
| • Cancelled Acct | -0.007 | - | - | - | - |
| • Economic Assumption | 0.000 | - | -0.067 | - | -0.067 |
| • Defense Wide Review Adjustment | 0.000 | - | -2.578 | - | -2.578 |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 4: *Advanced Component Development & Prototypes (ACD&P)* | **R-1 Program Element (Number/Name)**<br>PE 0603851D8Z *I Environmental Security Technology Certification Program (ESTCP)* |

**Change Summary Explanation**

The decrease of $0.292 million is the result of planned program changes in OUSD(A&S).

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 4 | R-1 Program Element (Number/Name)<br>PE 0603851D8Z / *Environmental Security Technology Certification Program (ESTCP)* | Project (Number/Name)<br>514 / *Environmental Security Technology Certification Program* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 514: *Environmental Security Technology Certification Program* | 414.186 | 41.058 | 68.572 | 61.345 | - | 61.345 | 57.178 | 57.162 | 58.011 | 59.202 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

The Environmental Security Technology Certification Program (ESTCP) demonstrates and validates promising and innovative environmental and energy technologies that target DoD's most urgent needs. Technologies selected are projected to provide a return on the investment through cost savings and improved efficiencies. The program responds to: (1) Congressional concern over the slow pace of remediation of environmentally polluted sites on military installations, (2) Congressional direction to conduct demonstrations specifically focused on emerging new technologies, and (3) the need to improve defense readiness by reducing the drain on the Department's operation and maintenance dollars caused by environmental restoration, waste management, and the cost of energy. Preference for demonstrations is given to technologies that have successfully completed all necessary research and development objectives, and address the highest priority DoD requirements.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| ***Title:*** Environmental Technology Demonstration/Validation | 23.843 | 39.226 | 36.245 | - | 36.245 |
| ***Description:*** Funds are programmed for investments in projects that address priority DoD environmental requirements. The focus of the program is on live site unexploded ordnance (UXO) in the underwater environment, addressing emerging and recalcitrant cleanup issues, range sustainment technologies, and reducing life cycle costs of DoD weapon systems by eliminating hazardous materials. Accomplishments/plans are described for each FY below. | | | | | |
| ***FY 2020 Plans:***<br>Continued investments in detection, quantification and remediation of per- and polyfluorinated alkyl substances (PFAS), large-scale demonstration of low-frequency acoustic systems for underwater UXO detection and classification, monitoring technologies to facilitate the management of threatened and endangered species, and surface preparation for corrosion control. New investments in fire management technologies for DoD Installations and demonstration of alternative formulations for Aqueous Film Forming Foam (AFFF) are also planned. | | | | | |
| ***FY 2021 Base Plans:***<br>Transition of additional projects focused on detection, quantification and remediation of per- and polyfluorinated alkyl substances (PFAS) from SERDP development, complete two large-scale demonstrations of low-frequency | | | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0603851D8Z / *Environmental Security Technology Certification Program (ESTCP)* | **Project (Number/Name)**<br>514 / *Environmental Security Technology Certification Program* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| acoustic systems for underwater UXO detection and classification, and development of an Infrastructure Resiliency Arctic Engineering Design Tool. Expansion of the demonstration efforts for alternative formulations for AFFF as new agents are developed in SERDP.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The decrease of $2.981 million is the result of funding reprioritization to emphasize PFAS and AFFF replacement demonstrations. | | | | | |
| ***Title:*** Energy Technology Demonstration/Validation | 17.215 | 27.346 | 25.100 | - | 25.100 |
| ***Description:*** Funds are programmed for investments in energy projects that constitute the Installation Energy Test Bed Initiative. This initiative responds to Congressional direction for the Department to increase energy efficiency, reduce installation energy intensity, increase the use of renewable energy, and improve energy security. Emerging energy technologies offer DoD a cost effective opportunity to meet these requirements on its installations while reducing energy and operational costs. The DoD test bed program validates and tests the operational cost and performance of innovative energy technologies in a real-world integrated building environment so as to reduce risk, overcome the barriers to deployment, and facilitate wide-scale deployment. The test bed program exploits the Department's existing built infrastructure to evaluate energy efficiency and renewable energy technologies under the varied climatic conditions and building types DoD manages. The test bed's key elements are: 1) competitive selection of new technologies, 2) systematic and consistent evaluation to determine performance, operational readiness and life cycle costs, and 3) development of guidance and design information for future deployment across installations.<br>***FY 2020 Plans:***<br>Demonstration in FY 2020 will continue the emphasis on cyber-security as it relates to installation energy savings and security. ESTCP continues to demonstrate technologies and monitoring schemes that are able to obtain Authority-to-Operate on DoD networks and develops a Department-wide strategy for implementation.<br>***FY 2021 Base Plans:***<br>Demonstrations will focus on energy storage within DoD microgrids as one component of increased Installation energy resilience. Continued emphasis on Energy Efficiency Technology Demonstrations Integrated with Utility Energy Services Contracts (UESC) as a way to facilitate tech transfer of previously-demonstrated energy technologies into wide adoption.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:*** | | | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0603851D8Z / *Environmental Security Technology Certification Program (ESTCP)* | **Project (Number/Name)**<br>514 / *Environmental Security Technology Certification Program* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| The increase of $2.246 million is the result of the planned completion of a series of micro-grid demonstrations at installations throughout the country. | | | | | |
| ***Title:*** Sustainable Technologies Evaluation and Demonstration Program<br>***Description:*** Congressionally mandated Evaluation and Demonstration Program<br>***FY 2020 Plans:***<br>Continue efforts to develop and demonstrate sustainable technologies and integrate them into the defense supply chain.<br>***FY 2021 Base Plans:***<br>None<br>***FY 2021 OCO Plans:***<br>None<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Congressional addition for FY20 | 0.000 | 2.000 | 0.000 | 0.000 | 0.000 |
| **Accomplishments/Planned Programs Subtotals** | 41.058 | 68.572 | 61.345 | 0.000 | 61.345 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

ESTCP solicits proposals from all DoD organizations, other Federal Agencies, and the commercial sector. Projects are selected based on an annual competitive process through reviews by multi-agency panels.

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0603851D8Z / *Environmental Security Technology Certification Program (ESTCP)* | **Project (Number/Name)**<br>514 / *Environmental Security Technology Certification Program* |

**Support ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Support Contract | C/IDDQ | Noblis : Reston, VA | 19.791 | 2.940 | Jan 2019 | 2.940 | Jan 2019 | 2.940 | Jan 2019 | - | | 2.940 | Continuing | Continuing | 19.650 |
| | | **Subtotal** | 19.791 | 2.940 | | 2.940 | | 2.940 | | - | | 2.940 | Continuing | Continuing | N/A |

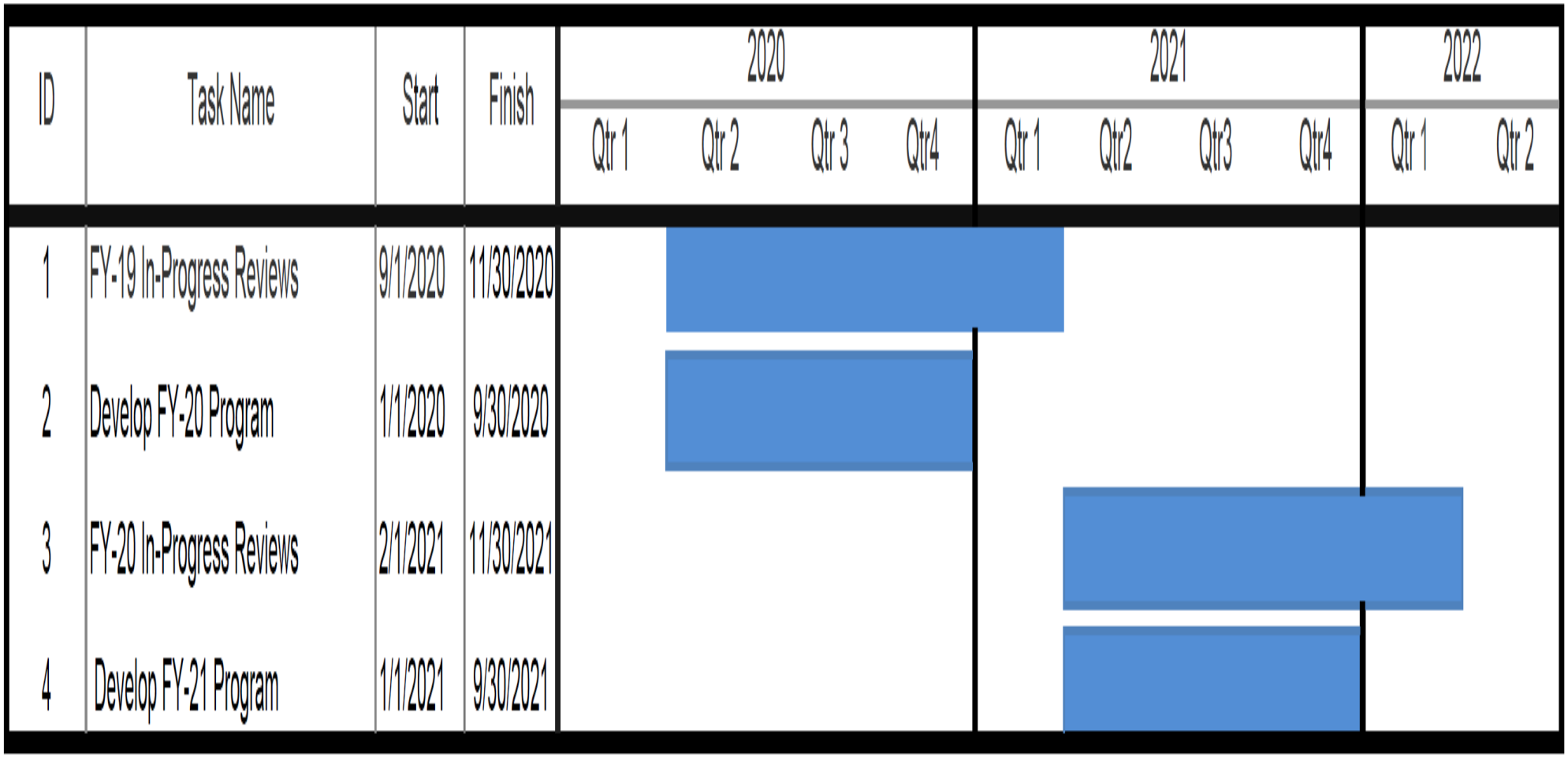
**Test and Evaluation ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Energy and Water | C/Various | Various : Various | 171.313 | 17.215 | | 28.730 | | 25.100 | | - | | 25.100 | Continuing | Continuing | - |
| Weapons Systems and Platforms | C/Various | Various : Various | 64.499 | 5.589 | | 9.337 | | 9.653 | | - | | 9.653 | Continuing | Continuing | - |
| Munitions Response | C/Various | Various : Various | 42.683 | 5.142 | | 8.584 | | 7.723 | | - | | 7.723 | Continuing | Continuing | - |
| Environmental Restoration | C/Various | Various : Various | 76.483 | 6.483 | | 10.823 | | 10.619 | | - | | 10.619 | Continuing | Continuing | - |
| Resource Conservation and Resiliency | C/Various | Various : Various | 39.417 | 3.689 | | 6.158 | | 5.310 | | - | | 5.310 | Continuing | Continuing | - |
| Sustainable Technologies Evaluation and Demonstration Program | C/Various | Various : Various | - | - | | 2.000 | | - | | - | | - | Continuing | Continuing | - |
| | | **Subtotal** | 394.395 | 38.118 | | 65.632 | | 58.405 | | - | | 58.405 | Continuing | Continuing | N/A |

| | Prior Years | FY 2019 | | FY 2020 | | FY 2021 Base | | FY 2021 OCO | | FY 2021 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | 414.186 | 41.058 | | 68.572 | | 61.345 | | - | | 61.345 | Continuing | Continuing | N/A |

**Remarks**

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0603851D8Z / *Environmental Security Technology Certification Program (ESTCP)* | **Project (Number/Name)**<br>514 / *Environmental Security Technology Certification Program* |



| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0603851D8Z / *Environmental Security Technology Certification Program (ESTCP)* | **Project (Number/Name)**<br>514 / *Environmental Security Technology Certification Program* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***In Progress Reviews*** | | | | |
| FY 2018 In Progress Reviews | 2 | 2019 | 1 | 2020 |
| FY 2019 In Progress Reviews | 2 | 2020 | 1 | 2021 |
| ***Develop Program*** | | | | |
| Develop FY 2019 Program | 2 | 2019 | 4 | 2019 |
| Develop FY 2020 Program | 2 | 2020 | 4 | 2020 |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 4: *Advanced Component Development & Prototypes (ACD&P)* | **R-1 Program Element (Number/Name)**<br>PE 0603920D8Z / *Humanitarian De-mining* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 77.723 | 10.952 | 14.700 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| 920: *Humanitarian De-mining* | 77.723 | 10.952 | 14.700 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**Note**

Defense-Wide Reviews (DWR) - Funding for the Initiative will end in FY 2021 resulting from the DWR, which focused on the Secretary's guidance to streamline operations, increase efficiency, and promote greater affordability within the OSD and Defense Agencies and Field Activities in order to ensure the Department's optimum alignment to the National Defense Strategy and DoD strategic guidance, with particular focus on building a more lethal, resilient, agile, and ready force while strengthening alliances, prioritizing cyber and space capabilities, and focusing on innovation to maintain the technological advantage. These funds will transfer to the Dept. of the Army.

**A. Mission Description and Budget Item Justification**

The Humanitarian Demining Research and Development (HD R&D) Program is overseen by the Deputy Assistant Secretary for Stability and Humanitarian Affairs (SHA) within the Assistant Secretary of Defense for Special Operations/Low – Intensity Conflict (SO/LIC) in the Office of the Under Secretary of Defense (OUSD) for Policy. The HD R&D Program coordinates with SHA and the with Humanitarian Mine Action (HMA) programs of the Geographical Combatant Commands (CCMD) to develop, demonstrate and validate cost-effective technologies for use in humanitarian demining via OCONUS operational field evaluations. The HD R&D Program's low-cost and highly effective technology reduces landmine and UXO threat to the local population and US forces, and bolsters host nations' mine action capacity while improving DoD's visibility and access, generating long-term positive perceptions of DoD and the USG, and fostering collaborative relationships with host nation governments. The program directly supports the National Defense Strategy through ensuring common domains remain open and free.

The HD R&D Program crafts a research and development plan based on CCMDs' security cooperation and theater campaign plan objectives to advance the state-of-the-art of demining technology and evaluate prototype technology utilizing host nation humanitarian demining operations partners. Continuous operations test data against live mines/UXO around the world is unavailable to any other DoD organization. Such data informs HD R&D Program investment decisions and is leveraged by U.S. military countermine R&D programs to improve U.S. forces' technology. In addition, the program conducts mine and UXO detector training at the Humanitarian Demining Training Center (HDTC) in support of mil-to-mil training and partnerships. Since 1995 the program has fielded technologies for 227 evaluations in 42 countries, including Afghanistan, Iraq, Vietnam, Cambodia, Angola and Zimbabwe. The program's technologies have cleared 66.8 million square meters of the world's toughest minefields, and found or destroyed 205,474 mines and UXO.

New technology requirements and areas of emphasis are identified and validated at a biennial Requirements Workshop and a biennial UXO Working Group Meeting held by OASD SO/LIC. The meetings involve representatives from Department of State (DOS), CCMD Humanitarian Mine Action programs, international mine action organizations and mine-affected nations. The program element's work fulfills the Department of Defense's strategic guidance to address instability and reduce the demand for significant US force commitments to stability operations; with DODI 3000.05 to foster security, economic security and development, and build indigenous capacity; and with § 407 and CJCSI 3207.01C to reduce the social, economic and environmental impact of landmines and unexploded ordnance.

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 4: *Advanced Component Development & Prototypes (ACD&P)* | **R-1 Program Element (Number/Name)**<br>PE 0603920D8Z / *Humanitarian De-mining* |

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 11.262 | 10.820 | 10.952 | - | 10.952 |
| Current President's Budget | 10.952 | 14.700 | 0.000 | - | 0.000 |
| Total Adjustments | -0.310 | 3.880 | -10.952 | - | -10.952 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | 3.880 | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | -0.002 | - | | | |
| • SBIR/STTR Transfer | -0.308 | - | | | |
| • Reductions were in support of Departmental efficiencies and economic assumptions | - | - | -0.308 | - | -0.308 |
| • Funding has been transferred to the Dept. of the Army beginning in FY21 and out. | - | - | -10.644 | - | -10.644 |

**Change Summary Explanation**

Reductions were in support of Departmental efficiencies and economic assumptions. Funding has been transferred to the Dept. of the Army beginning in FY21 and out.

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** 0603920D8Z - SO/LIC Humanitarian De-mining | 10.952 | 14.700 | 0.000 |

***Description:*** The HD R&D Program adapts commercial-off-the-shelf equipment, integrates mature technologies, and leverages R&D activity within DoD, particularly in the Army's Night Vision and Electronic Sensors Directorate (NVESD) Tactical Countermine mission area. The program aims to improve existing technologies for: mine/unexploded ordnance (UXO) detection, technical survey/area reduction, mechanical mine/UXO clearance, underwater UXO detection and clearance, vegetation clearance, mechanical mine neutralization, and post-clearance quality control (QC).

***FY 2020 Plans:***

• • Deploy new technology, including Scorpion to Afghanistan; Badger and Little Storm to Cambodia; Little Storm and Rambo to Colombia; HSTAMIDS mine detectors to Colombia and Lebanon; Robomax and Vehicle-Mounted Mine Detection System to Ukraine

• Complete ongoing equipment developments/modifications and test technology including survey and mine/UXO detection technologies such as Combined Auxiliary Positioning System, Delta-2, Empact 3D, Minelab MDS-10, Minelab F3Ci, Minelab

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 4: *Advanced Component Development & Prototypes (ACD&P)* | **R-1 Program Element (Number/Name)**<br>PE 0603920D8Z / *Humanitarian De-mining* |

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| F3 Compact, Vallon VMH4, Vallon VMR3, Vallon VR-1, Ceia CMD3 and Minex 4.600; and vegetation and mine clearance and neutralization technologies<br>• Continue successful operational evaluations from FY2019<br>• Support the combatant commands and Embassy staffs by conducting new site surveys and country assessments in Colombia, Laos, Lebanon, Thailand, Vietnam<br>• Convene UXO Working Group Meeting in Thailand to identify technology needs for battle area clearance<br>• Develop, test and evaluate new prototype technologies based on feedback from the field and working group meeting<br>***FY 2021 Plans:***<br>Deploy new technology to Iraq, Laos, potentially Syria and other countries<br>• Complete ongoing equipment developments/modifications<br>• Continue successful operational evaluations from FY2020<br>• Support the combatant commands and Embassy staffs by conducting new site surveys and country assessments<br>• Convene Demining Requirements Workshop to define critical technology needs globally<br>• Develop, test and evaluate new prototype technologies based on feedback from the field in the following areas: technical survey, individual mine/UXO and minefield detection, mechanical mine/UXO and vegetation clearance, underwater UXO detection and clearance, mechanical mine neutralization, and post-clearance QA<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding has been transferred to the Dept. of the Army beginning in FY21 and out. | | | |
| **Accomplishments/Planned Programs Subtotals** | 10.952 | 14.700 | 0.000 |

**D. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**E. Acquisition Strategy**

Following a rapid prototyping strategy, the program emphasizes the use/modification of existing, commercially-available equipment and components to build functional prototype equipment suited for humanitarian demining operations. This approach is required due to the immediate need for new demining technologies in the face of ongoing U.S. forces and host nation citizen casualties in mine-affected countries. The program evaluates prototype equipment by acquiring it off-the-shelf from industry using competition to the extent possible, by leveraging ongoing countermine R&D efforts in other U.S. and foreign R&D activities, and by taking advantage of extensive in-house fabrication capabilities at the Army's Night Vision and Electronic Sensors Division (NVESD).

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0603920D8Z / *Humanitarian De-mining* | **Project (Number/Name)**<br>920 / *Humanitarian De-mining* |

**Product Development ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Primary Hardware Development | Various | RDECOM-NVESD : Ft Belvoir, VA | 44.129 | 4.960 | | 7.939 | | 0.000 | | 0.000 | | 0.000 | Continuing | Continuing | - |
| | | **Subtotal** | 44.129 | 4.960 | | 7.939 | | 0.000 | | 0.000 | | 0.000 | Continuing | Continuing | N/A |

**Remarks**

The HD R&D Program adapts commercial-off-the-shelf equipment, integrates mature technologies, and leverages R&D activity within DoD, particularly in the Army's Night Vision and Electronic Sensors Directorate (NVESD) Tactical Countermine mission area.

**Test and Evaluation ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Humanitarian Demining Research and Development Program | Various | RDECOM-NVESD : Ft Belvoir, VA | 31.323 | 5.718 | | 6.489 | | 0.000 | | - | | 0.000 | Continuing | Continuing | - |
| | | **Subtotal** | 31.323 | 5.718 | | 6.489 | | 0.000 | | - | | 0.000 | Continuing | Continuing | N/A |

**Remarks**

Evaluations of HD R&D Program-developed technologies in actual minefields are conducted by host nation demining partners (foreign military, non-governmental organizations and mine action centers) and provide valuable data for US military countermine R&D and next generation HD technology developments while directly contributing to world-wide mine and UXO clearance.

**Management Services ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Humanitarian Demining Program Management Support | Various | RDECOM-NVESD : Ft Belvoir, VA | 2.271 | 0.274 | | 0.272 | | 0.000 | | - | | 0.000 | Continuing | Continuing | - |
| | | **Subtotal** | 2.271 | 0.274 | | 0.272 | | 0.000 | | - | | 0.000 | Continuing | Continuing | N/A |

**Remarks**

The HD R&D Program managers oversee adaptation of commercial-off-the-shelf equipment, integration of mature technologies, and leverage of R&D activity within DoD, particularly in the Army's Night Vision and Electronic Sensors Directorate (NVESD) Tactical Countermine mission area. Areas of emphasis are identified and validated at a

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0603920D8Z / *Humanitarian De-mining* | **Project (Number/Name)**<br>920 / *Humanitarian De-mining* |

**Management Services ($ in Millions)**

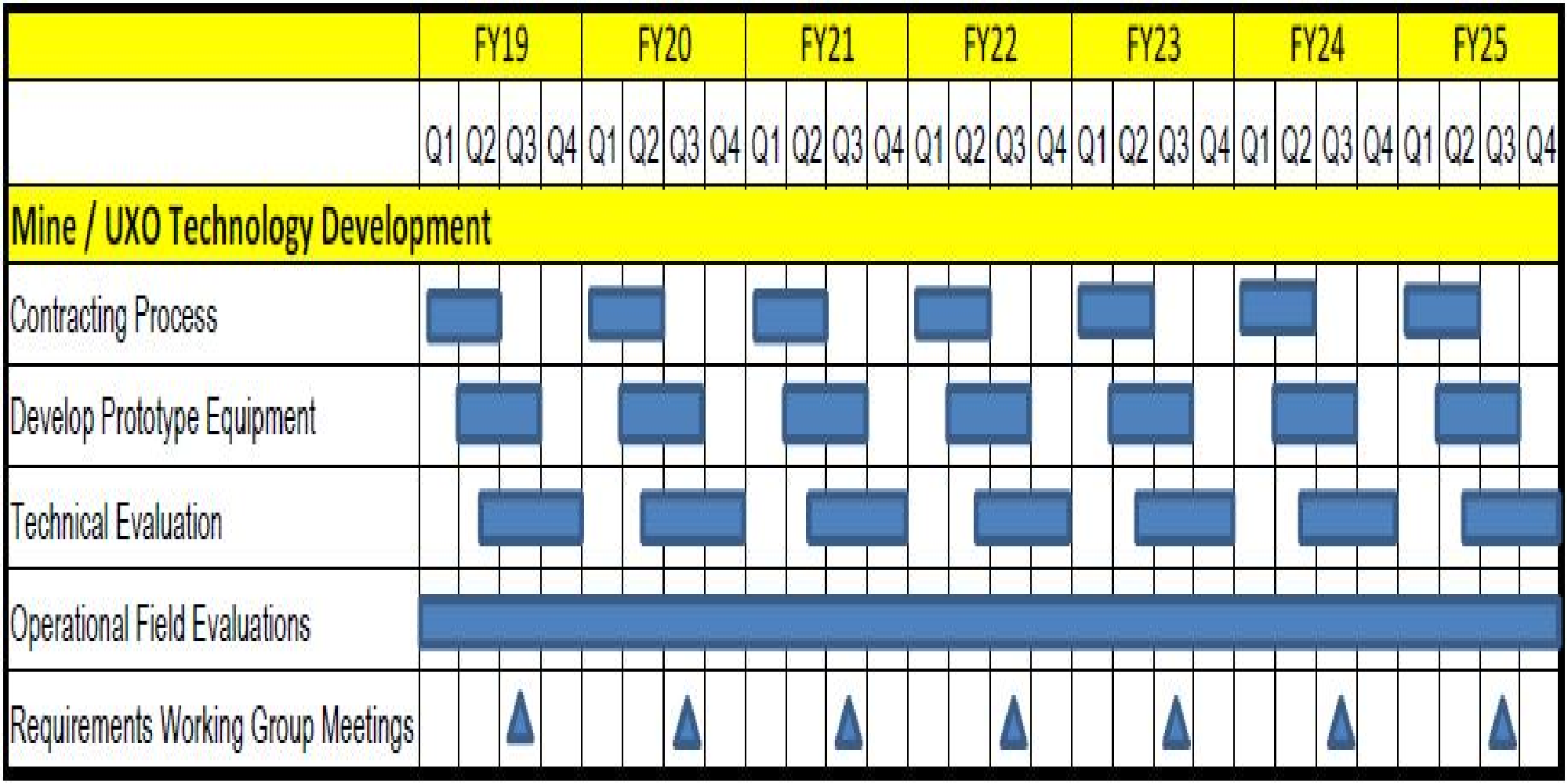
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| biennial Requirements Workshop held by OASD SO/LIC. The Requirements Workshop involves representatives from Department of State (DoS), U.S. combatant commands (COCOMS) and mine-affected nations. | | | | | | | | | | | | | | | |

| | Prior Years | FY 2019 | | FY 2020 | | FY 2021 Base | | FY 2021 OCO | | FY 2021 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | 77.723 | 10.952 | | 14.700 | | 0.000 | | 0.000 | | 0.000 | Continuing | Continuing | N/A |

**Remarks**

The Humanitarian Demining Research and Development (HD R&D) program element rapidly develops, demonstrates and validates new technologies for DoD-supported nations to detect and clear landmines and unexploded ordnance (UXO), and to contribute to US military countermine R&D. The HD R&D Program focuses on development of new technologies to improve the efficiency and safety of indigenous nation-conducted, post-conflict clearance of residual mines and UXO, which pose a serious threat to US forces conducting stability operations, and to the host nation's population and economy.

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0603920D8Z / *Humanitarian De-mining* | **Project (Number/Name)**<br>920 / *Humanitarian De-mining* |



| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0603920D8Z / *Humanitarian De-mining* | **Project (Number/Name)**<br>920 / *Humanitarian De-mining* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events** | **Quarter** | **Year** | **Quarter** | **Year** |
| Mechanical Mine/UXO Clearance Systems | 1 | 2019 | 4 | 2025 |
| Mine/UXO Detection Systems | 1 | 2019 | 4 | 2025 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 4: *Advanced Component Development & Prototypes (ACD&P)* | **R-1 Program Element (Number/Name)**<br>PE 0603923D8Z / *Coalition Warfare Program (CWP)* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 72.750 | 8.379 | 11.316 | 10.129 | - | 10.129 | 9.491 | 9.650 | 9.688 | 9.892 | Continuing | Continuing |
| 923: *Coalition Warfare* | 72.750 | 8.379 | 11.316 | 10.129 | - | 10.129 | 9.491 | 9.650 | 9.688 | 9.892 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

The Coalition Warfare Program (CWP) supports DoD organizations that: 1) work with foreign partners to collaboratively address strategic technology gaps for current and future missions; 2) develop interoperability solutions for coalition operations; and 3) develop and strengthen defense relationships. CWP comprehensively addresses all three National Defense Strategy lines of effort: to develop a more lethal joint force; strengthen alliances and attract new partners; and implement business practices for greater performance and affordability. Coalition warfare and multinational operations are fundamental features of the U.S. National Security Strategy. Coalitions provide a broad base of technological, operational, and logistical support for military operations and ease the U.S. financial and manpower burdens associated with meeting military goals and objectives. Coalitions and relationships with international partners are high priorities for the nation and the Department of Defense.

CWP supplements a U.S. Government proponent's funding for cooperative efforts, ensuring U.S. funds are sufficient to complete the engagement with the foreign partner(s). When CWP funds are used to help fund a cooperative project, that project leverages technical and financial contributions of the foreign partner(s) and speeds the development and delivery of technical solutions to the warfighter. For every $1 CWP has invested in cooperative projects, the program has leveraged $3 in foreign partner resources – from 76 foreign partners – and $2 in other U.S. Government resources, providing an overall 5:1 return on investment. CWP funding enables DoD project teams to move a technology into the next stage of development or to complete and transition a technology to operational forces. These projects may also form the basis for future cooperation with international partners.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 8.528 | 11.316 | 11.050 | - | 11.050 |
| Current President's Budget | 8.379 | 11.316 | 10.129 | - | 10.129 |
| Total Adjustments | -0.149 | 0.000 | -0.921 | - | -0.921 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | -0.129 | - | | | |
| • FFRDC | -0.019 | - | - | - | - |
| • Other Program Adjustments | -0.001 | - | -0.319 | - | -0.319 |
| • Defense Wide Review Adjustment | - | - | -0.602 | - | -0.602 |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 4: *Advanced Component Development & Prototypes (ACD&P)* | **R-1 Program Element (Number/Name)**<br>PE 0603923D8Z / *Coalition Warfare Program (CWP)* |

**Change Summary Explanation**

The FY 2021 funding request was reduced by $0.602 million as a result of the Defense Wide Review, which focused on the Secretary's guidance to streamline operations, increase efficiency, and promote greater affordability within the OSD and Defense Agencies and Field Activities in order to ensure the Department's optimum alignment to the National Defense Strategy and DoD strategic guidance, with particular focus on building a more lethal, resilient, agile, and ready force while strengthening alliances, prioritizing cyber and space capabilities, and focusing on innovation to maintain the technological advantage."

An additional $0.319 million dollars was re-aligned to support planned program changes within the Office of the Under Secretary of Defense Acquisition and Sustainment OUSD(A&S).

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 4 | R-1 Program Element (Number/Name)<br>PE 0603923D8Z / *Coalition Warfare Program (CWP)* | Project (Number/Name)<br>923 / *Coalition Warfare* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 923: *Coalition Warfare* | 72.750 | 8.379 | 11.316 | 10.129 | - | 10.129 | 9.491 | 9.650 | 9.688 | 9.892 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

The Coalition Warfare Program (CWP) supports DoD organizations that: 1) work with foreign partners to collaboratively address strategic technology gaps for current and future missions; 2) develop interoperability solutions for coalition operations; and 3) develop and strengthen defense relationships. CWP comprehensively addresses all three National Defense Strategy lines of effort: to develop a more lethal joint force; strengthen alliances and attract new partners; and implement business practices for greater performance and affordability. Coalition warfare and multinational operations are fundamental features of the U.S. National Security Strategy. Coalitions provide a broad base of technological, operational, and logistical support for military operations and ease the U.S. financial and manpower burdens associated with meeting military goals and objectives. Coalitions and relationships with international partners are high priorities for the nation and the Department of Defense.

CWP supplements a U.S. Government proponent's funding for cooperative efforts, ensuring U.S. funds are sufficient to complete the engagement with the foreign partner(s). When CWP funds are used to help fund a cooperative project, that project leverages technical and financial contributions of the foreign partner(s) and speeds the development and delivery of technical solutions to the warfighter. For every $1 CWP has invested in cooperative projects, the program has leveraged $3 in foreign partner resources – from 76 foreign partners – and $2 in other U.S. Government resources, providing an overall 5:1 return on investment. CWP funding enables DoD project teams to move a technology into the next stage of development or to complete and transition a technology to operational forces. These projects may also form the basis for future cooperation with international partners.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Coalition Warfare Program (Continuing Projects) | 8.379 | 11.316 | 10.129 |
| ***Description:*** CWP provides funding on a competitive basis to DoD organizations to conduct cooperative research, development, test, and evaluation projects with foreign partners. The goals of the CWP program are to: collaboratively address strategic technology gaps for current and future missions, develop interoperability solutions for coalition operations, and strengthen current defense partnerships and developing new relationships. CWP selects projects for funding through an annual competitive selection process in accordance with Department of Defense and Combatant Command needs.<br><br>In addition to funding newly selected projects, the program also provides funding to projects that began in earlier selection cycles (for a total of up to three years of funding for each project). Currently, the funded portfolio includes projects with 15 different foreign partners.<br><br>Including prior year project selections, for FY 2020, the following projects will encompass CWP funding in FY 2020 and FY 2021: | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0603923D8Z / *Coalition Warfare Program (CWP)* | **Project (Number/Name)**<br>923 / *Coalition Warfare* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|

- Air-Breathing, Long Range Munition Demonstration (US Navy)
- Compact, Agile and Lightweight Refractive Infrared Non-Mechanical Beam Steering (US Navy)
- Autonomous & Robotic Remote Refueling Point for Tactical Rotary Wing Aircraft (US Army)
- Collaborative and Heterogeneous Counter small Unmanned Aerial Systems (US Army)
- Common Space Hazard and Threat Awareness (US Air Force)
- Micro Aerial Chemical Detection System (US Army)
- Mid-Latitude Plasma Density Irregularities (US Air Force)
- Development & Optimization of Nano-Grained Boron Carbide Ceramic Armor (US Army)
- Severe Acute Respiratory Infection Threat Characterization in Jordan: Toward a MERS Vaccine (US Army)
- Synthetic Aperture Radar Automatic Target Recognition for Space-based Sensors (US Navy)
- Virtual Interoperability Prototyping Research Environment (OSD)
- Wideband AR Surfaces for Warfighter Systems (US Navy)
- Interoperability and Collaboration Initiatives: Program provides funds in support of new or planned acquisition programs with the aim of 1) promoting coalition interoperability early in the requirements or technical development phases, 2) harmonizing common goals between U.S. and foreign partners, 3) improving management of collaborative efforts. Funds support workshops, risk reduction efforts, standards development, architecture analysis, and information management initiatives.

***FY 2020 Plans:***
Completion of efforts that will reduce size, weight, and power of non-GPS positioning, navigation, and timing processors for soldier-borne equipment; develop autonomous vertical take-off and landing unmanned aerial systems deployment and charging from mobile ground and surface vessel units; develop solid and liquid-fueled ramjet engines, and develop a coalition interoperable electronic warfare battle management system for common operating picture.

***FY 2021 Plans:***
Completion of efforts that will increase the range and lethality of gun-launched munitions using solid fuel ramjets; optimize size, weight, and power for non-mechanical beam steering; develop autonomous operational energy solutions for helicopters; develop chemical agent detection payloads for micro-unmanned aircraft; develop artificial intelligence agents and custom munitions for defeating small unmanned aerial systems; and automatic target recognition for sensing un-flagged sea vessels.

***FY 2020 to FY 2021 Increase/Decrease Statement:***
The FY 2021 funding request was reduced by $0.602 million as a result of the Defense Wide Review, which focused on the Secretary's guidance to streamline operations, increase efficiency, and promote greater affordability within the OSD and Defense Agencies and Field Activities in order to ensure the Department's optimum alignment to the National Defense Strategy and DoD

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0603923D8Z / *Coalition Warfare Program (CWP)* | **Project (Number/Name)**<br>923 / *Coalition Warfare* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| strategic guidance, with particular focus on building a more lethal, resilient, agile, and ready force while strengthening alliances, prioritizing cyber and space capabilities, and focusing on innovation to maintain the technological advantage."<br><br>An additional funding was re-aligned to support planned program changes within the Office of the Under Secretary of Defense Acquisition and Sustainment OUSD(A&S). | | | |
| **Accomplishments/Planned Programs Subtotals** | 8.379 | 11.316 | 10.129 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

The Combatant Commands, Services, Defense Agencies, and the Office of the Secretary of Defense nominate candidate projects on an annual basis. CWP provides selected projects up to three years of funding. The Program selects projects that address DoD priorities and meet the needs and requirements specified by the Joint Staff and the Combatant Commanders. Projects have equitable contributions from international partners, strong potential for transition, Combatant Command endorsement, and contribute to allied interoperability and/or meet a user need.

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0603923D8Z / *Coalition Warfare Program (CWP)* | **Project (Number/Name)**<br>923 / *Coalition Warfare* | |

**Product Development ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coalition Warfare Program Project Product Development Costs | Various | Various : Various | 51.843 | 6.849 | | 9.536 | | 8.382 | | - | | 8.382 | - | - | - |
| | | **Subtotal** | 51.843 | 6.849 | | 9.536 | | 8.382 | | - | | 8.382 | - | - | N/A |

**Test and Evaluation ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coalition Warfare Program Project Test and Evaluation Costs | Various | Various : Various | 12.170 | 0.715 | | 0.950 | | 0.902 | | - | | 0.902 | - | - | - |
| | | **Subtotal** | 12.170 | 0.715 | | 0.950 | | 0.902 | | - | | 0.902 | - | - | N/A |

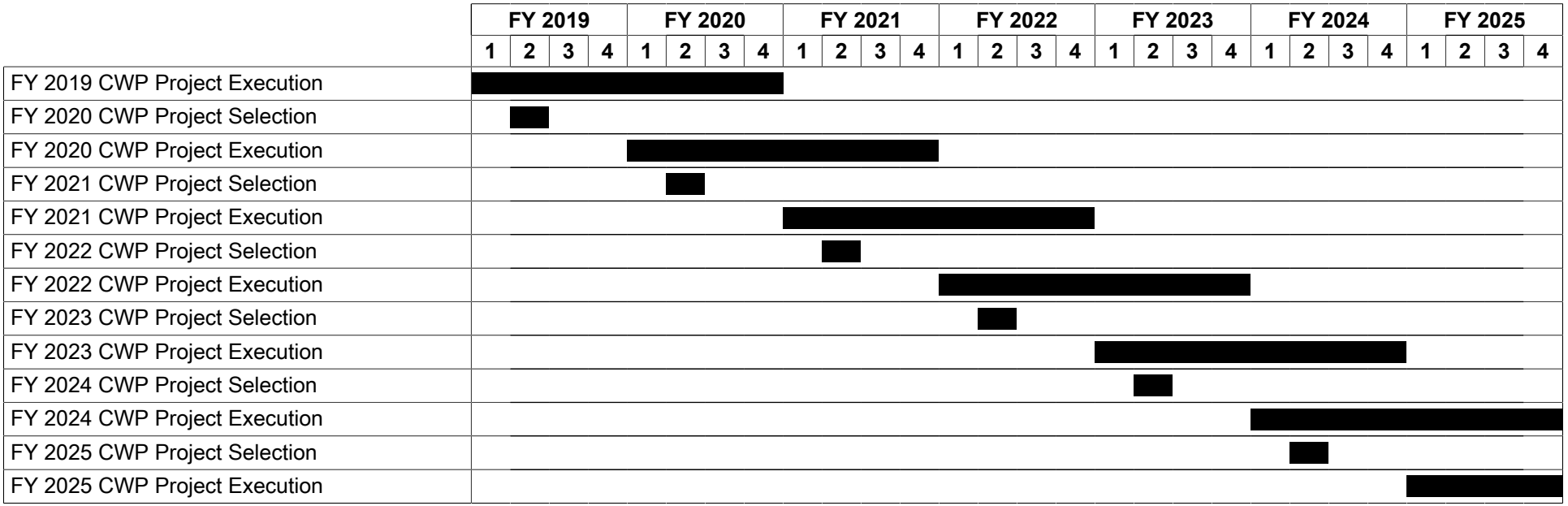
**Management Services ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coalition Warfare Program Project Management Services Costs | Option/ FFP | Analygence, INC. : Fulton, MD | 8.737 | 0.815 | | 0.830 | | 0.845 | | - | | 0.845 | - | - | - |
| | | **Subtotal** | 8.737 | 0.815 | | 0.830 | | 0.845 | | - | | 0.845 | - | - | N/A |

| | Prior Years | FY 2019 | | FY 2020 | | FY 2021 Base | | FY 2021 OCO | | FY 2021 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | 72.750 | 8.379 | | 11.316 | | 10.129 | | - | | 10.129 | - | - | N/A |

**Remarks**

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0603923D8Z / *Coalition Warfare Program (CWP)* | **Project (Number/Name)**<br>923 / *Coalition Warfare* |



| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0603923D8Z / *Coalition Warfare Program (CWP)* | **Project (Number/Name)**<br>923 / *Coalition Warfare* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events** | **Quarter** | **Year** | **Quarter** | **Year** |
| FY 2019 CWP Project Execution | 1 | 2019 | 4 | 2020 |
| FY 2020 CWP Project Selection | 2 | 2019 | 2 | 2019 |
| FY 2020 CWP Project Execution | 1 | 2020 | 4 | 2021 |
| FY 2021 CWP Project Selection | 2 | 2020 | 2 | 2020 |
| FY 2021 CWP Project Execution | 1 | 2021 | 4 | 2022 |
| FY 2022 CWP Project Selection | 2 | 2021 | 2 | 2021 |
| FY 2022 CWP Project Execution | 1 | 2022 | 4 | 2023 |
| FY 2023 CWP Project Selection | 2 | 2022 | 2 | 2022 |
| FY 2023 CWP Project Execution | 1 | 2023 | 4 | 2024 |
| FY 2024 CWP Project Selection | 2 | 2023 | 2 | 2023 |
| FY 2024 CWP Project Execution | 1 | 2024 | 4 | 2025 |
| FY 2025 CWP Project Selection | 2 | 2024 | 2 | 2024 |
| FY 2025 CWP Project Execution | 1 | 2025 | 4 | 2025 |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 4: *Advanced Component Development & Prototypes (ACD&P)* | **R-1 Program Element (Number/Name)**<br>PE 0604011D8Z / *Next Generation ICT (5G)* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | - | 52.000 | 200.000 | 449.000 | - | 449.000 | 376.000 | 333.000 | 133.000 | 200.000 | Continuing | Continuing |
| 724: *Dual Use 5G Use Cases* | - | 32.000 | 102.500 | 227.000 | - | 227.000 | 72.000 | 54.000 | 20.000 | 51.000 | Continuing | Continuing |
| 725: *Congested/Congested Spectrum* | - | 14.000 | 90.000 | 207.000 | - | 207.000 | 285.000 | 260.000 | 103.000 | 139.000 | Continuing | Continuing |
| 726: *External Engagement* | - | 6.000 | 7.500 | 15.000 | - | 15.000 | 19.000 | 19.000 | 10.000 | 10.000 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

The Department of Defense (DoD) Next Generation (NextG) Information Communications Technologies (ICT) program will conduct large-scale experimentation and prototyping of dual-use (military and commercial) fifth-generation of cellular network (5G) technology for military uses. The program will develop and deploy ultra-reliable low latency communication (URLLC) 5G networks at DoD sites to evaluate and enhance 5G systems and technologies for domestic and expeditionary DoD missions. This will include both the direct use of commercially available capabilities and DoD-specific technology enhancements that highly leverage commercial capabilities. The program will also develop, test, and evaluate technology solutions to identify and mitigate the security challenges that 5G and NextG technologies will present in order to enable the military to operate through zero-trust networks. The program will:

• Deploy flexible 5G infrastructure at approximately eight U.S. military facilities to enable varied applications and networking prototypes
• Evaluate at least sixteen different DoD 5G applications at DoD facilities across the Services
• Invest in DoD-focused 5G tactical, operational and strategic networking prototypes to expand the utility of commercial technologies for DoD missions
• Demonstrate the capacity to “operate through” in contested environments using dynamic spectrum utilization and by learning how to both defend and exploit 5G networks through security vulnerability assessment

The program will deliver fieldable prototype capabilities that will remain in place at designated DoD locations as well as lessons learned to promulgate 5G knowledge and tradecraft. This will ensure that both near-term and future generations of information and communications technologies will be capable of supporting US military and national security objectives.

The program will be executed through established support agreements with DoD Service laboratories and through existing DoD and Government-Wide Acquisition Contracts (GWACs) (including General Services Administration (GSA) contracts) that are suitable and cost-effective for 5G technology prototyping and telecommunications network equipment procurement and integration.

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 4: *Advanced Component Development & Prototypes (ACD&P)* | **R-1 Program Element (Number/Name)**<br>PE 0604011D8Z / *Next Generation ICT (5G)* |

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 0.000 | 0.000 | 0.000 | - | 0.000 |
| Current President's Budget | 52.000 | 200.000 | 449.000 | - | 449.000 |
| Total Adjustments | 52.000 | 200.000 | 449.000 | - | 449.000 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | 200.000 | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | 52.000 | - | | | |
| • SBIR/STTR Transfer | - | - | | | |
| • Increase for NextG Information Communications Technology | - | - | 449.000 | - | 449.000 |

**Change Summary Explanation**

FY 2020 Congressional Add of $200.000 million for Next Generation Information Communications Technology.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 4 | R-1 Program Element (Number/Name)<br>PE 0604011D8Z / *Next Generation ICT (5G)* | Project (Number/Name)<br>724 / *Dual Use 5G Use Cases* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 724: *Dual Use 5G Use Cases* | - | 32.000 | 102.500 | 227.000 | - | 227.000 | 72.000 | 54.000 | 20.000 | 51.000 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

Develop and experiment with "dual-use" applications that demonstrate direct use of commercial systems and applications that use a large fraction of commercial capabilities that are augmented with DoD enhancements. Dual-use applications will be evaluated within a deployed 5G infrastructure with operationally relevant numbers of users and geographic scale. These use cases include:

• Mission Planning/Training: Develop and experiment with ultra-high reliability, low latency, high bandwidth, as well as augmented and virtual reality technologies that enable high fidelity mission planning and training in realistic adversarial environments over 5G networks.
• Depot Operations: Leverage 5G technologies to upgrade depots for "smart" operations including autonomous repair and maintenance activities as well as warehouse movement via driverless forklifts, pallets, and tactical trucks.
• Global Asset/Supply Chain Management: Leverage emerging 5G enterprise solutions to provide real time, optimum, continuous asset visibility and movement tracking, supply status, movement and resupply, and reduce inventory control costs.
• Smart Installations (e.g., logistics bases, ports): Develop and experiment with 5G enabled massive machine-to-machine communications, cloud and edge computing, and autonomy to enhance installation operations to maximize logistics traffic throughput.

Dual Use 5G research, development, and experimentation activities will deliver fieldable prototype capabilities that will remain in place at designated DoD locations. Those that do not perform sufficiently well will still provide lessons learned to promulgate 5G knowledge and tradecraft. These deliverables will inform base/camp/station modernization and recapitalization investments as prototypes transition to enduring infrastructure.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Dual Use 5G Use Cases | 32.000 | 102.500 | 227.000 |
| ***Description:*** Demonstrate use cases of both commercial and military value, while also assessing and developing mitigations to their security vulnerabilities. | | | |
| ***FY 2020 Plans:***<br>DoD will initiate Smart Warehouse prototyping and experimentation projects at Marine Corps Logistics Base Albany, Georgia, and at Naval Base San Diego, California. DoD will also initiate an Augmented/Virtual Reality (AR/VR) Mission Training prototyping and experimentation project at Joint Base Lewis-McChord, Washington. | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604011D8Z / *Next Generation ICT (5G)* | **Project (Number/Name)**<br>724 / *Dual Use 5G Use Cases* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Localized full scale 5G mobile cellular networks will be designed and initially constructed in order to support the prototyping and experimentation activities at each site. The output of the project will be capabilities (e.g. fieldable equipment and control systems) and processes to demonstrate the designated dual-use military 5G applications.<br>***FY 2021 Plans:***<br>DoD will continue Smart Warehouse prototyping and experimentation activities at MCLB-A, and NBSD; and will continue AR/ VR Mission Training prototyping and experimentation activities at JBLM. Construction of localized full scale 5G mobile cellular networks will be expanded and interfaced with base networks in order to conduct further development and experimentation of autonomous warehouse operations and AR/VR mission training activities.<br><br>DoD will initiate approximately four additional dual-use prototyping and experimentation projects at DoD Service designated sites. Localized full scale 5G mobile cellular networks will be designed and initially constructed in order to support the dual-use military application experimentation at designated DoD Service sites.<br><br>DoD will initiate approximately four additional dual-use prototyping and experimentation projects at DoD Service designated sites. Localized full scale 5G mobile cellular networks will be designed and initially constructed in order to support the dual-use military application experimentation at designated DoD Service sites.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Level of effort increases between FY 2020 and FY 2021 due to the addition of new DoD experimentation sites in FY 2021. | | | |
| **Accomplishments/Planned Programs Subtotals** | 32.000 | 102.500 | 227.000 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 4 | R-1 Program Element (Number/Name)<br>PE 0604011D8Z / *Next Generation ICT (5G)* | Project (Number/Name)<br>724 / *Dual Use 5G Use Cases* | |

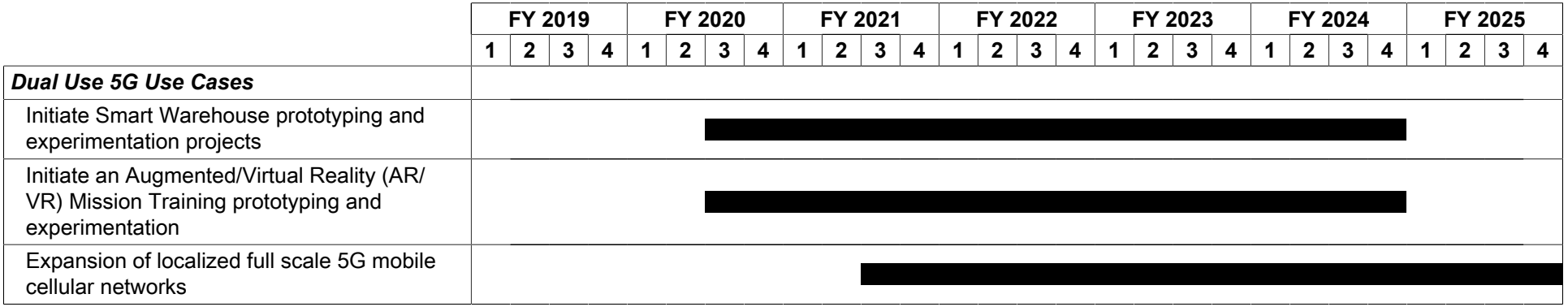
**Product Development ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dual Use 5G Use Cases | MIPR | Army, Navy, Air Force, etc. : Various | - | 32.000 | Jan 2020 | 102.500 | Jun 2020 | 227.000 | Mar 2021 | - | | 227.000 | Continuing | Continuing | - |
| | | **Subtotal** | - | 32.000 | | 102.500 | | 227.000 | | - | | 227.000 | Continuing | Continuing | N/A |

| | Prior Years | FY 2019 | | FY 2020 | | FY 2021 Base | | FY 2021 OCO | | FY 2021 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | - | 32.000 | | 102.500 | | 227.000 | | - | | 227.000 | Continuing | Continuing | N/A |

**Remarks**

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604011D8Z / *Next Generation ICT (5G)* | **Project (Number/Name)**<br>724 / *Dual Use 5G Use Cases* |



| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604011D8Z / *Next Generation ICT (5G)* | **Project (Number/Name)**<br>724 / *Dual Use 5G Use Cases* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***Dual Use 5G Use Cases*** | | | | |
| Initiate Smart Warehouse prototyping and experimentation projects | 3 | 2020 | 4 | 2024 |
| Initiate an Augmented/Virtual Reality (AR/VR) Mission Training prototyping and experimentation | 3 | 2020 | 4 | 2024 |
| Expansion of localized full scale 5G mobile cellular networks | 3 | 2021 | 4 | 2025 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 4 | R-1 Program Element (Number/Name)<br>PE 0604011D8Z / *Next Generation ICT (5G)* | Project (Number/Name)<br>725 / *Congested/Congested Spectrum* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 725: *Congested/Congested Spectrum* | - | 14.000 | 90.000 | 207.000 | - | 207.000 | 285.000 | 260.000 | 103.000 | 139.000 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

Demonstrate the capacity to “operate through” in contested environments using dynamic spectrum utilization and controlled exploitation of 5G network security architectures. These capabilities will be based on technologies such as multi-networking across wired and wireless systems, network monitoring including new AI and firewall techniques, and dynamic spectrum utilization. Develop tactical, operational, and strategic networking prototypes to demonstrate capabilities to dynamically share congested spectrum between military systems and commercial wireless networks.

Capabilities will be prototyped and evaluated at-scale within highly dynamic and contested RF environments. The Congested/Contested Spectrum research, development, and experimentation activities will deliver fieldable prototype capabilities that will remain in place at designated DoD locations. Those that do not perform sufficiently well will still provide lessons learned to promulgate 5G knowledge and tradecraft. These deliverables will inform base/camp/station modernization and recapitalization investments as prototypes transition to enduring infrastructure.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Congested/Contested Spectrum | 14.000 | 90.000 | 207.000 |
| ***Description:*** Demonstrate the capacity to “operate through” in congested/contested environments using dynamic spectrum utilization and by prototyping technologies to both defend and exploit 5G networks.<br><br>***FY 2020 Plans:***<br>Initiate congested/contested spectrum prototyping and experimentation activities at Hill AFB, Utah. A localized full scale 5G mobile cellular network will be designed and initially constructed in order to evaluate the impact of the 5G network on the airborne radar systems and the radar’s impact on the 5G network, employing both active and passive techniques to enable sharing or coexistence. The output of the project will be capabilities (e.g., fieldable equipment and control systems) and processes to allow spectrum sharing or coexistence with cooperating and non-cooperating 5G networks.<br><br>Invest in key technologies such as resilient networking protocols, trusted edge devices, cognitive gateways, homomorphic encryption, and secure 5G ASICs.<br><br>***FY 2021 Plans:***<br>Continue congested/contested spectrum prototyping and experimentation activities at Hill AFB, Utah. Construction of a localized full scale 5G mobile cellular network will be expanded in order to evaluate the impact of the 5G network on the airborne | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604011D8Z / *Next Generation ICT (5G)* | **Project (Number/Name)**<br>725 / *Congested/Congested Spectrum* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| radar systems and the radar's impact on the 5G network, employing both active and passive techniques to enable sharing or coexistence.<br><br>Initiate approximately three additional congested/contested spectrum prototyping and experimentation projects at DoD Service designated sites. Localized full scale 5G mobile cellular networks will be designed and initially constructed in order to evaluate the impact of the 5G network on selected military systems.<br><br>Continue investments in key technologies, such as: resilient networking protocols, trusted edge devices, cognitive gateways, homomorphic encryption, and secure 5G ASICs.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Level of effort increases between FY 2020 and FY 2021 due to the addition of new DoD experimentation sites in FY 2021. | | | |
| **Accomplishments/Planned Programs Subtotals** | 14.000 | 90.000 | 207.000 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 4 | R-1 Program Element (Number/Name)<br>PE 0604011D8Z / *Next Generation ICT (5G)* | Project (Number/Name)<br>725 / *Congested/Congested Spectrum* | |

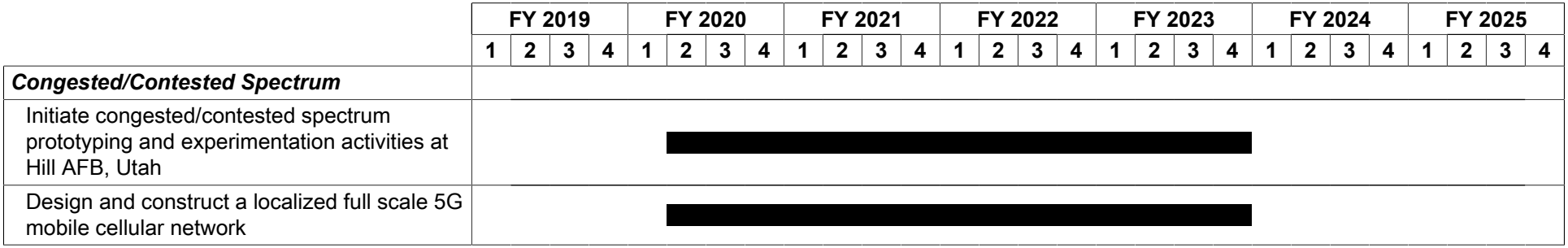
**Product Development ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Congested/Contested Spectrum | MIPR | Army, Navy, Air Force, Marine Corps, etc. : Various | - | 14.000 | Jan 2020 | 90.000 | Mar 2020 | 207.000 | Mar 2021 | - | | 207.000 | Continuing | Continuing | - |
| | | **Subtotal** | - | 14.000 | | 90.000 | | 207.000 | | - | | 207.000 | Continuing | Continuing | N/A |

| | Prior Years | FY 2019 | | FY 2020 | | FY 2021 Base | | FY 2021 OCO | | FY 2021 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | - | 14.000 | | 90.000 | | 207.000 | | - | | 207.000 | Continuing | Continuing | N/A |

**Remarks**

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604011D8Z / *Next Generation ICT (5G)* | **Project (Number/Name)**<br>725 / *Congested/Congested Spectrum* |



| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604011D8Z / *Next Generation ICT (5G)* | **Project (Number/Name)**<br>725 / *Congested/Congested Spectrum* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***Congested/Contested Spectrum*** | | | | |
| Initiate congested/contested spectrum prototyping and experimentation activities at Hill AFB, Utah | 2 | 2020 | 4 | 2023 |
| Design and construct a localized full scale 5G mobile cellular network | 2 | 2020 | 4 | 2023 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 4 | R-1 Program Element (Number/Name)<br>PE 0604011D8Z / *Next Generation ICT (5G)* | Project (Number/Name)<br>726 / *External Engagement* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 726: *External Engagement* | - | 6.000 | 7.500 | 15.000 | - | 15.000 | 19.000 | 19.000 | 10.000 | 10.000 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

Funding from this project will be used to conduct external engagements across Government and beyond to influence statutes, policies, regulations, and standards within DoD, the U.S. Government, and international bodies for the global deployment and use of 5G to Next G technologies. DoD will conduct active and passive security vulnerability assessments of 5G prototypes in order to support zero-trust security designs for military 5G applications.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** External Engagement | 6.000 | 7.500 | 15.000 |
| ***Description:*** Develop policies, regulations, and standards for streamlined deployment of protected, resilient Government and commercial networks. Conduct active and passive security vulnerability assessments to support 5G security capabilities.<br><br>***FY 2020 Plans:***<br>Engage across government and beyond to inform and influence statutes, policies, regulations, and standards within DoD, the U.S. Government, and international bodies. Through a support agreement with the Army Threat Systems Management Office (TSMO) and with the support of DoD laboratory experts, DoD will conduct security vulnerability assessments of designated Dual-Use and Congested/Contested Spectrum experimentation efforts during FY 2020.<br><br>***FY 2021 Plans:***<br>Continue to engage across government and beyond to inform and influence statutes, policies, regulations, and standards within DoD, the U.S. Government, and international bodies. DoD will continue to conduct security vulnerability assessments of an increased number of Dual-Use and Congested/Contested Spectrum experimentation efforts during FY 2021.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Level of effort increases between FY 2020 and FY 2021 due to the addition of new DoD experimentation sites in FY 2021. | | | |
| **Accomplishments/Planned Programs Subtotals** | 6.000 | 7.500 | 15.000 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 4 | R-1 Program Element (Number/Name)<br>PE 0604011D8Z / *Next Generation ICT (5G)* | Project (Number/Name)<br>726 / *External Engagement* | |

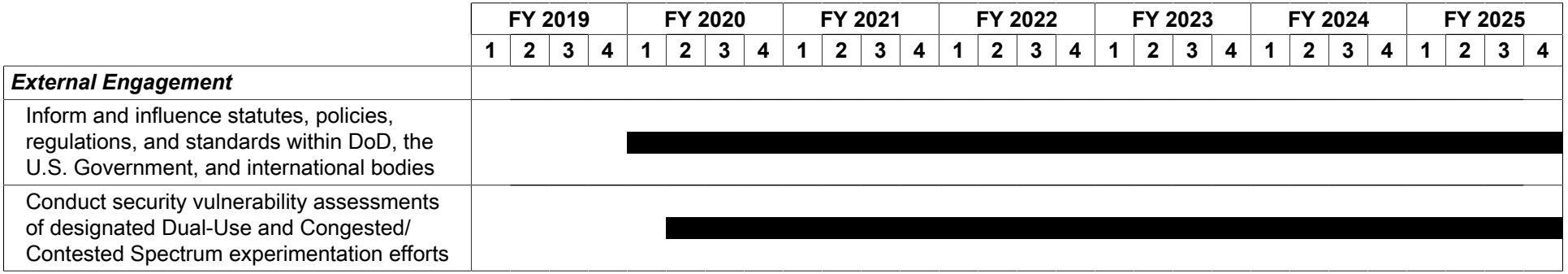
**Product Development ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| External Engagement | MIPR | Army, Navy, Air Force, Marine Corps, etc. : Various | - | 6.000 | Jan 2020 | 7.500 | Mar 2020 | 15.000 | Mar 2021 | - | | 15.000 | Continuing | Continuing | - |
| | | **Subtotal** | - | 6.000 | | 7.500 | | 15.000 | | - | | 15.000 | Continuing | Continuing | N/A |

| | Prior Years | FY 2019 | | FY 2020 | | FY 2021 Base | | FY 2021 OCO | | FY 2021 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | - | 6.000 | | 7.500 | | 15.000 | | - | | 15.000 | Continuing | Continuing | N/A |

**Remarks**

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604011D8Z / *Next Generation ICT (5G)* | **Project (Number/Name)**<br>726 / *External Engagement* |



| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604011D8Z / *Next Generation ICT (5G)* | **Project (Number/Name)**<br>726 / *External Engagement* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***External Engagement*** | | | | |
| Inform and influence statutes, policies, regulations, and standards within DoD, the U.S. Government, and international bodies | 1 | 2020 | 4 | 2025 |
| Conduct security vulnerability assessments of designated Dual-Use and Congested/ Contested Spectrum experimentation efforts | 2 | 2020 | 4 | 2025 |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 4: *Advanced Component Development & Prototypes (ACD&P)* | **R-1 Program Element (Number/Name)**<br>PE 0604016D8Z / *Department of Defense Corrosion Program* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 122.994 | 9.281 | 13.165 | 3.325 | - | 3.325 | 3.373 | 3.437 | 3.508 | 3.582 | Continuing | Continuing |
| 015: *Corrosion Protection Projects* | 122.994 | 9.281 | 13.165 | 3.325 | - | 3.325 | 3.373 | 3.437 | 3.508 | 3.582 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

The purpose of this program is to develop a comprehensive capability to prevent and mitigate corrosion and its effects on Department of Defense (DoD) weapon systems and infrastructure. Corrosion severely impacts system and facility reliability, readiness and safety, and consumes a disproportionate amount of material and labor hours for repair and treatment of corrosion damaged systems and facilities. The cost of corrosion across the DoD is currently in excess of $19 billion per year (down from approximately $22 billion in Fiscal Year 2007). The impacts and costs are so pervasive that Congress enacted Public Law 107-314 Sec: 1067 Prevention and mitigation of corrosion of military infrastructure and equipment [portions codified in 10 U.S.C. 2228]. This legislation requires that DoD develop a long-term corrosion strategy to include establishment of a coordinated R&D program with transition plans. The legislation also requires that DoD designate a responsible official or organization to oversee a corrosion prevention and mitigation program. The responsibilities of the Director, Corrosion Policy and Oversight and the Military Department Corrosion Prevention and Control Executives were further delineated in DODI 5000.67 "Prevention and Mitigation of Corrosion on Military Equipment and Infrastructure" of 01 February 2010.

A major responsibility of the Director, Corrosion Policy and Oversight (CPO) is to select high payoff research and development projects that promise to prevent or mitigate corrosion and significantly reduce the total cost of corrosion along with the adverse impact of corrosion effects on weapon system and infrastructure operational capability. This office chartered a Corrosion Prevention and Control Integrated Product Team (CPCIPT) that has selected and funded Operation and Maintenance projects for each Fiscal Year (FY) commencing in FY 2005. However, the DoD CPCIPT has determined that the biggest payoff in corrosion prevention and mitigation will come from investing in up-front prevention technologies, materials, and processes to leverage downstream cost avoidance in corrosion maintenance and repair. Likewise, development of improved predictive and prognostic techniques can eliminate unseen failure and reduce unnecessary maintenance and repair costs. Thus, technology development, demonstration, and transition projects have been selected and funded since FY 2006. These projects address critical corrosion issues in both Department of Defense systems and infrastructure. A number of low-risk, high-payoff technologies promise to vastly improve the service life and significantly reduce the maintenance costs and improve the availability and safety of weapon systems and facilities essential to maintain support for the warfighter. A total of 85 projects have been completed including a follow-on assessment of their return on investment estimates. The overall return on investment as estimated by the Military Departments is 17.2:1.

In addition, the University Corrosion Collaboration (now the Technical Corrosion Collaboration (TCC)) was formed as collaboration between universities, Armed Forces Academies and DoD laboratories focused on corrosion technology research and development, and building a workforce with corrosion expertise for the DoD. Research areas include performance prediction, assessment of finishes, surface engineering, and product support. This advanced corrosion research has been ongoing since FY 2008 and performed by teams from TCC participating organizations.

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 4: *Advanced Component Development & Prototypes (ACD&P)* | **R-1 Program Element (Number/Name)**<br>PE 0604016D8Z / *Department of Defense Corrosion Program* |

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 3.458 | 3.365 | 3.425 | - | 3.425 |
| Current President's Budget | 9.281 | 13.165 | 3.325 | - | 3.325 |
| Total Adjustments | 5.823 | 9.800 | -0.100 | - | -0.100 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | 5.000 | 9.800 | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | 0.938 | - | | | |
| • SBIR/STTR Transfer | -0.114 | - | | | |
| • Cancelled Acct | -0.001 | - | -0.095 | - | -0.095 |
| • Economic Assumption | - | - | -0.005 | - | -0.005 |

| Congressional Add Details ($ in Millions, and Includes General Reductions) | FY 2019 | FY 2020 |
|---|---|---|
| **Project:** 015: *Corrosion Protection Projects* | | |
| Congressional Add: *Congressional Add: Corrosion Prevention and Control Projects and Activities* | 5.000 | - |
| Congressional Add Subtotals for Project: 015 | 5.000 | - |
| Congressional Add Totals for all Projects | 5.000 | - |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | | | | | | | | | Date: February 2020 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 4 | | | | | R-1 Program Element (Number/Name)<br>PE 0604016D8Z / *Department of Defense Corrosion Program* | | | | Project (Number/Name)<br>015 / *Corrosion Protection Projects* | | | |
| **COST ($ in Millions)** | **Prior Years** | **FY 2019** | **FY 2020** | **FY 2021 Base** | **FY 2021 OCO** | **FY 2021 Total** | **FY 2022** | **FY 2023** | **FY 2024** | **FY 2025** | **Cost To Complete** | **Total Cost** |
| 015: *Corrosion Protection Projects* | 122.994 | 9.281 | 13.165 | 3.325 | - | 3.325 | 3.373 | 3.437 | 3.508 | 3.582 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

The purpose of this program is to develop a comprehensive capability to prevent and mitigate corrosion and its effects on Department of Defense (DoD) weapon systems and infrastructure. Corrosion severely impacts system and facility reliability, readiness and safety, and consumes a disproportionate amount of material and labor hours for repair and treatment of corrosion damaged systems and facilities. The cost of corrosion across the DoD is currently in excess of $19 billion per year (down from approximately $22 billion in Fiscal Year 2007). The impacts and costs are so pervasive that Congress enacted Public Law 107-314 Sec: 1067 Prevention and mitigation of corrosion of military infrastructure and equipment [portions codified in 10 U.S.C. 2228]. This legislation requires that DoD develop a long-term corrosion strategy to include establishment of a coordinated R&D program with transition plans. The legislation also requires that DoD designate a responsible official or organization to oversee a corrosion prevention and mitigation program. The responsibilities of the Director, Corrosion Policy and Oversight and the Military Department Corrosion Prevention and Control Executives were further delineated in DODI 5000.67 "Prevention and Mitigation of Corrosion on Military Equipment and Infrastructure" of 01 February 2010.

A major responsibility of the Director, Corrosion Policy and Oversight (CPO) is to select high payoff research and development projects that promise to prevent or mitigate corrosion and significantly reduce the total cost of corrosion along with the adverse impact of corrosion effects on weapon system and infrastructure operational capability. This office chartered a Corrosion Prevention and Control Integrated Product Team (CPCIPT) that has selected and funded Operation and Maintenance projects for each Fiscal Year (FY) commencing in FY 2005. However, the DoD CPCIPT has determined that the biggest payoff in corrosion prevention and mitigation will come from investing in up-front prevention technologies, materials, and processes to leverage downstream cost avoidance in corrosion maintenance and repair. Likewise, development of improved predictive and prognostic techniques can eliminate unseen failure and reduce unnecessary maintenance and repair costs. Thus, technology development, demonstration, and transition projects have been selected and funded since FY 2006. These projects address critical corrosion issues in both Department of Defense systems and infrastructure. A number of low-risk, high-payoff technologies promise to vastly improve the service life and significantly reduce the maintenance costs and improve the availability and safety of weapon systems and facilities essential to maintain support for the warfighter. A total of 85 projects have been completed including a follow-on assessment of their return on investment estimates. The overall return on investment as estimated by the Military Departments is 17.2:1.

In addition, the University Corrosion Collaboration (now the Technical Corrosion Collaboration (TCC)) was formed as collaboration between universities, Armed Forces Academies and DoD laboratories focused on corrosion technology research and development, and building a workforce with corrosion expertise for the DoD. Research areas include performance prediction, assessment of finishes, surface engineering, and product support. This advanced corrosion research has been ongoing since FY 2008 and performed by teams from TCC participating organizations.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604016D8Z / *Department of Defense Corrosion Program* | **Project (Number/Name)**<br>015 / *Corrosion Protection Projects* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Corrosion Prevention and Control Projects and Activities | 4.281 | 13.165 | 3.325 |
| ***FY 2020 Plans:***<br>Continue to:<br>• Collaborate with the Services to develop and transition mature technologies and eliminate duplicative investments in technology development;<br>• Refine and improve acquisition and sustainment policies related to corrosion control;<br>• Support independent risk assessments relative to corrosion for ACAT I systems;<br>• Complete impact of corrosion studies on all defense segments;<br>• Integrate corrosion control into critical specifications and standards;<br>• Partner with the Services to develop and provide corrosion training to military and DoD civilians;<br>• Engage in communication and outreach activities to create awareness of solutions to corrosion problems and the associated cost reductions and readiness improvements;<br>• Initiate a major update of the DoD Corrosion Prevention and Mitigation Strategic Plan in coordination with the Military Departments. | | | |
| ***FY 2021 Plans:***<br>Continue to:<br>• Collaborate with the Services to develop and transition mature technologies and eliminate duplicative investments in technology development;<br>• Refine and improve acquisition and sustainment policies related to corrosion control;<br>• Support independent risk assessments relative to corrosion for ACAT I systems;<br>• Complete impact of corrosion studies on all defense segments;<br>• Integrate corrosion control into critical specifications and standards;<br>• Partner with the Services to develop and provide corrosion training to military and DoD civilians;<br>• Engage in communication and outreach activities to create awareness of solutions to corrosion problems and the associated cost reductions and readiness improvements;<br>• Finalize a major update of the DoD Corrosion Prevention and Mitigation Strategic Plan in coordination with the Military Departments;<br>• Update DoDI 5000.67 and issue an associated manual to document CPO processes. | | | |
| ***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The decrease is a result of planned program changes in the OUSD (A&S) budget. | | | |
| **Accomplishments/Planned Programs Subtotals** | 4.281 | 13.165 | 3.325 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604016D8Z / *Department of Defense Corrosion Program* | **Project (Number/Name)**<br>015 / *Corrosion Protection Projects* |

| | FY 2019 | FY 2020 |
|---|---|---|
| ***Congressional Add:*** Congressional Add: Corrosion Prevention and Control Projects and Activities | 5.000 | - |
| ***FY 2019 Accomplishments:*** Increased investment in projects by $1.5M. Increased investment in TCC by $2M. Used the remainder to do the following:<br>• Updated the General Building Unified Facilities Criteria UFC 1-200-01 to include requirements to consider environmental corrosivity when designing facilities<br>• Developed and deployed new training modules and knowledge pages for facilities professionals<br>• Extended availability of corrosion-related training for military and DoD civilians | | |
| **Congressional Adds Subtotals** | 5.000 | - |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Acquisitions are accomplished in three categories including projects, research opportunities, and activities as described in the DoD Corrosion Prevention and Mitigation Strategic Plan.

Projects are funded jointly by CPO and the Military Departments and are led by subject matter experts at the Military Department laboratories. CPO issues a call for proposed project plans in April and projects are submitted in June. The project plan format is contained in the DoD Corrosion Prevention and Mitigation Strategic Plan. CPO receives project plans and convenes evaluation selection panel to review proposed projects and make recommendations regarding project selection. Projects are evaluated on factors including project performance period, ratio of OSD funding to Service funding, return-on-investment (ROI), degree to which the proposed technology addresses high-cost corrosion problems, potential benefits, joint service applicability, and probability of transition. Upon acceptance and approval of the projects, funding is distributed to the Military Departments by Military Interdepartmental Purchase Request (MIPR) based on funding priorities associated with the evaluation process results. Project execution is monitored through submission of quarterly quad charts and by conducting an annual review.

Research opportunities are funded through the Technical Corrosion Collaboration (TCC). A call for white paper proposals is issued by CPO through an existing U.S. Air Force Academy (USAFA) Broad Agency Announcement (BAA). Submissions are evaluated by a technical panel. Evaluation factors include quality of proposed research, potential impact on DoD corrosion problems, level of student involvement, and proposed collaboration between the research institutions and DoD laboratories. Projects are ranked by the selection panel and funded based on merit and available funds. Research institutions receive funds for the TCC through the establishment of cooperative agreements with USAFA. Research execution is monitored through submission of quarterly quad charts and by conducting an annual review.

Activities are those work efforts associated with the Working Integrated Product Teams (WIPT) under the CPCIPT and include policy, training, specifications and standards, metrics, science and technology, facilities, and communication and outreach. WIPT Leads submit funding requirements associated with their annual

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604016D8Z / *Department of Defense Corrosion Program* | **Project (Number/Name)**<br>015 / *Corrosion Protection Projects* |

tactical plan submission to CPO. The proposed activities are prioritized by CPO and funded based on merit and available funds. Activities are accomplished by both government and contractor personnel. Funds are transferred to government personnel through the MIPR process. Funds are transferred to contractor personnel through competitively awarded contracts including the multiple-award Blanket Purchase Agreement held by OASD(S). Progress on activities is reviewed tri-annually at meetings of the CPCIPT.

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 4 | R-1 Program Element (Number/Name)<br>PE 0604016D8Z / *Department of Defense Corrosion Program* | Project (Number/Name)<br>015 / *Corrosion Protection Projects* | |

**Product Development ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Corrosion Policy and Oversight | MIPR | Various (Army, Navy, Air Force) : Various | 103.145 | 7.912 | Jan 2019 | 4.343 | Jan 2020 | 1.031 | Jan 2021 | - | | 1.031 | - | - | Continuing |
| | | **Subtotal** | 103.145 | 7.912 | | 4.343 | | 1.031 | | - | | 1.031 | - | - | N/A |

**Management Services ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Corrosion Policy and Oversight | MIPR | Logistics Management Institute : McLean, VA | 19.849 | 1.369 | Jul 2019 | 8.822 | Feb 2020 | 2.294 | Feb 2021 | - | | 2.294 | - | - | Continuing |
| | | **Subtotal** | 19.849 | 1.369 | | 8.822 | | 2.294 | | - | | 2.294 | - | - | N/A |

| | Prior Years | FY 2019 | | FY 2020 | | FY 2021 Base | | FY 2021 OCO | | FY 2021 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | 122.994 | 9.281 | | 13.165 | | 3.325 | | - | | 3.325 | - | - | N/A |

**Remarks**

N/A

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604016D8Z / *Department of Defense Corrosion Program* | **Project (Number/Name)**<br>015 / *Corrosion Protection Projects* |

| EXHIBIT R-4. SCHEDULE PROFILE | Date: September 2019 |
|---|---|
| Appropriation/ Budget Category: RDT&E, CORROSION PREVENTION AND CONTROL / BA 4 | Program Element: 0604016D8Z |

| PROJECT / TASK | 2019 | 2020 | | | | 2021 | | | | 2022 | | | | 2023 | | | | 2024 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 |
| | JUL AUG SEP | OCT NOV DEC | JAN FEB MAR | APR MAY JUN | JUL AUG SEP | OCT NOV DEC | JAN FEB MAR | APR MAY JUN | JUL AUG SEP | OCT NOV DEC | JAN FEB MAR | APR MAY JUN | JUL AUG SEP | OCT NOV DEC | JAN FEB MAR | APR MAY JUN | JUL AUG SEP | OCT NOV DEC | JAN FEB MAR |
| CORROSION POLICY AND OVERSIGHT | | | | | | | | | | | | | | | | | | | |
| DOD 5000-Series Review | 25% | 0% | | | | 0% | | | | 0% | | | | 0% | | | | 0% | |
| Integration of CPC and CPC-Related Policy | 25% | | | | | | | | | | | | | | | | | | |
| DAG Review | 25% | | | | | | | | | | | | | | | | | | |
| Corrosion Board of Directors | 25% | | | | | | | | | | | | | | | | | | |
| DOD Corrosion Prevention and Mitigation Strategic Plan | 25% | | | | | | | | | | | | | | | | | | |
| USC Engagement | 25% | | | | | | | | | | | | | | | | | | |
| GAO Engagement | 25% | | | | | | | | | | | | | | | | | | |
| Corrosion Technology Implementation Projects Support | 25% | | | | | | | | | | | | | | | | | | |
| Training Gap Analysis | 25% | | | | | | | | | | | | | | | | | | |
| Facilitate/Support Corrosion Events | 25% | | | | | | | | | | | | | | | | | | |
| International Corrosion Partnerships and Engagements | 25% | | | | | | | | | | | | | | | | | | |
| Programmatic Support | 25% | | | | | | | | | | | | | | | | | | |
| Technical Corrosion Collaboration | 25% | | | | | | | | | | | | | | | | | | |

| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604016D8Z / *Department of Defense Corrosion Program* | **Project (Number/Name)**<br>015 / *Corrosion Protection Projects* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***Corrosion Policy and Oversight*** | | | | |
| DOD 5000 Series Review | 4 | 2019 | 2 | 2024 |
| Integration of CPC and CPC-Related Policy | 4 | 2019 | 2 | 2024 |
| DAG Review | 4 | 2019 | 2 | 2024 |
| DOD Corrosion Prevention and Mitigation Strategic Plan | 4 | 2019 | 2 | 2024 |
| GAO Engagement | 4 | 2019 | 2 | 2024 |
| Corrosion Technology Implementation Projects Support | 4 | 2019 | 2 | 2024 |
| Training Gap Analysis | 4 | 2019 | 2 | 2024 |
| Facilitate/Support Corrosion Events | 4 | 2019 | 2 | 2024 |
| International Corrosion Partnerships and Engagements | 4 | 2019 | 2 | 2024 |
| Programmatic Support | 4 | 2019 | 2 | 2024 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 4: *Advanced Component Development & Prototypes (ACD&P)* | **R-1 Program Element (Number/Name)**<br>PE 0604132D8Z / *Missile Defeat Project* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 259.375 | 41.961 | 14.816 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| 072: *Missile Defeat Project* | 259.375 | 41.961 | 14.816 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

**Program MDAP/MAIS Code:**
**Project MDAP/MAIS Code(s):** 000

## A. Mission Description and Budget Item Justification

The Missile Defeat Project counters the growing global advancement and proliferation of road-mobile ballistic missile threats. The Missile Defeat Project coordinated and integrated Department of Defense and Intelligence Community efforts to develop counter-threat capability. In order to carry out the important role initiated by Missile Defeat, in accordance with the National Defense Authorization Act for FY 2017, the Missile Defeat Project transferred activities initiated under Missile Defeat to other stakeholders starting in FY 2019. In FY 2021 residual resources and capabilities are transferred to Program Element 0603338D8Z (Defense Modernization and Prototyping) in support of an expanded Multi-Domain Time Sensitive Targeting and Defeat (TSTD) alignment of key technology development and modernization effort.

Activities will be coordinated with the Services, appropriate Agencies, and the Combatant Commands to transition these developments into viable warfighting capabilities.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 43.508 | 17.816 | 9.897 | - | 9.897 |
| Current President's Budget | 41.961 | 14.816 | 0.000 | - | 0.000 |
| Total Adjustments | -1.547 | -3.000 | -9.897 | - | -9.897 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | -3.000 | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | -1.540 | - | | | |
| • Transfer to new Program Element (0603338D8Z) | - | - | -9.897 | - | -9.897 |
| • Other Program Adjustments | -0.007 | - | - | - | - |

**Change Summary Explanation**

The FY 2020 Congressional reduction of $3.000 million was directed due to justification criteria.

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 4: *Advanced Component Development & Prototypes (ACD&P)* | **R-1 Program Element (Number/Name)**<br>PE 0604132D8Z / *Missile Defeat Project* |

Effective FY 2021, residual resources are transferred to Program Element 0603338D8Z (Defense Modernization and Prototyping) to provide alignment, transparency and focus supporting development of key technologies and modernization within OUSD(R&E) identified capability thrust priorities.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 4 | R-1 Program Element (Number/Name)<br>PE 0604132D8Z / *Missile Defeat Project* | Project (Number/Name)<br>072 / *Missile Defeat Project* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 072: *Missile Defeat Project* | 259.375 | 41.961 | 14.816 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**Project MDAP/MAIS Code:** 000

**A. Mission Description and Budget Item Justification**

The Time Sensitive Target Defeat (TSTD) transferred all initiated activities to the Office of Under Secretary of Defense for Research and Engineering (OUSD(R&E)), Time Sensitive Target Defeat Office in FY 2019. The residual resources are transferred to Program Element 0603338D8Z (Defense Modernization and Prototyping) to provide alignment and focus supporting development of key technologies and modernization within OUSD(R&E) identified capability thrust priorities.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Missile Defeat Project efforts | 41.961 | 14.816 | 0.000 |

***Description:*** Missile Defeat will support the operational demonstration and assessments of sensors, command and control (C2), processing, exploitation, and dissemination (PED), and transition of residual capabilities to mission partners.
Missile Defeat Accomplishments:
• Completed the transition of the Pack Hunt decision aid collection management tool enhancement to evolve the operational state of the environment.
• Accomplished Upstream Data Fusion and Machine-to-Machine enhancement to increase the wide area F2T2 against TST.
• Integrated enhancement to the CIP enhancement by fusing a myriad of tactical and national data feeds in near-real time.
• Instituted SNAPGLASS to fill existing seams across an element of kill chains to reduce latency.
• Executed JUKEBOX 18 live fly to demonstrate and incorporated prototype capabilities to enable new kill webs for future weapon system.
• Demonstrated the deployment of SAR and C2 payloads during JB18 to show case the evolution of future warfare.

***FY 2020 Plans:***
Missile Defeat shall experiment with tripwire balloon capabilities to host a series of mission payloads that will enable left of launch capabilities during the Integrated Joint Combined Arms Demonstration Campaign. FY 2020 initiative continues to experiment with Skyfall to advance small satellite system while enable game changing capabilities. The PSASM operational planning tool shall enable the end-to-end kill chain for time critical targets in INDOPACOM targeting cell. Missile Defeat will closeout its remaining initiative by executing the recommendations of SPMD by transitioning the experimentation and demonstration to Time Sensitive Targeting Defeat to support the multi-domain mission of the Department.

***FY 2021 Plans:***

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604132D8Z / *Missile Defeat Project* | **Project (Number/Name)**<br>072 / *Missile Defeat Project* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Transition of residual Missile Defeat capability to PE 0603338D8Z / Defense Modernization and Prototyping.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>- The FY 2020 to FY 2021 decrease is due to a transition of current activities to other stakeholders and Program Element 0603338D8Z (Defense Modernization and Prototyping). | | | |
| **Accomplishments/Planned Programs Subtotals** | 41.961 | 14.816 | 0.000 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

In order to carry out the important effort initiated by Missile Defeat, FY 2021 residual resources and capabilities are transferred to Program Element 0603338D8Z (Defense Modernization and Prototyping) in support of an expanded Multi-Domain Time Sensitive Targeting and Defeat (TSTD) alignment of key technology development and modernization.

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 4 | R-1 Program Element (Number/Name)<br>PE 0604132D8Z / *Missile Defeat Project* | Project (Number/Name)<br>072 / *Missile Defeat Project* | |

**Test and Evaluation ($ in Millions)**

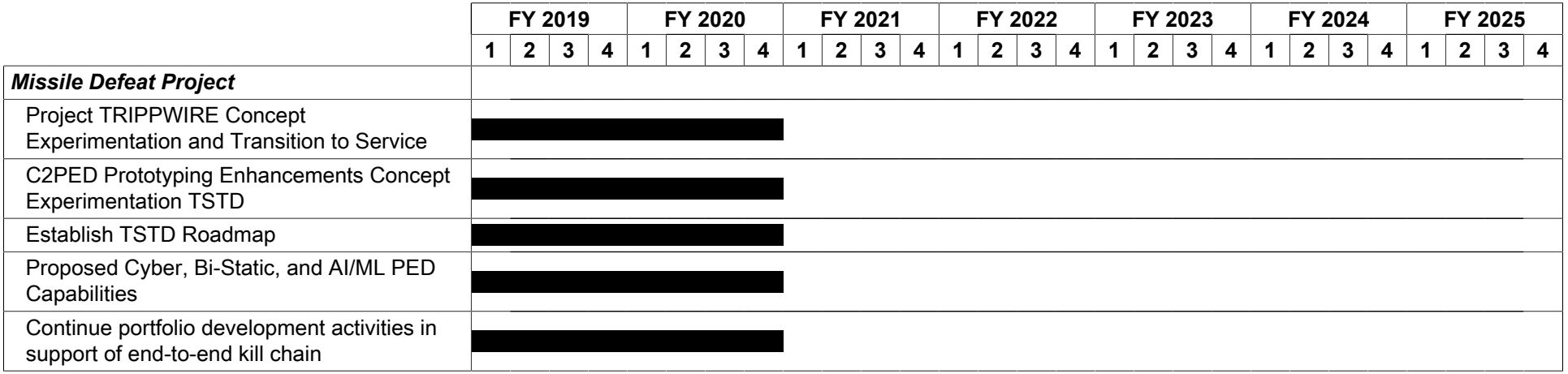
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Various | C/TBD | MULTI : MULTI | 259.375 | 41.961 | | 14.816 | | - | | - | | - | Continuing | Continuing | - |
| | | **Subtotal** | 259.375 | 41.961 | | 14.816 | | - | | - | | - | Continuing | Continuing | N/A |

| | Prior Years | FY 2019 | | FY 2020 | | FY 2021 Base | | FY 2021 OCO | | FY 2021 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | 259.375 | 41.961 | | 14.816 | | - | | - | | - | Continuing | Continuing | N/A |

**Remarks**

N/A

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604132D8Z / *Missile Defeat Project* | **Project (Number/Name)**<br>072 / *Missile Defeat Project* |



| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604132D8Z / *Missile Defeat Project* | **Project (Number/Name)**<br>072 / *Missile Defeat Project* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***Missile Defeat Project*** | | | | |
| Project TRIPPWIRE Concept Experimentation and Transition to Service | 1 | 2019 | 4 | 2020 |
| C2PED Prototyping Enhancements Concept Experimentation TSTD | 1 | 2019 | 4 | 2020 |
| Establish TSTD Roadmap | 1 | 2019 | 4 | 2020 |
| Proposed Cyber, Bi-Static, and AI/ML PED Capabilities | 1 | 2019 | 4 | 2020 |
| Continue portfolio development activities in support of end-to-end kill chain | 1 | 2019 | 4 | 2020 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 4: *Advanced Component Development & Prototypes (ACD&P)* | **R-1 Program Element (Number/Name)**<br>PE 0604250D8Z / *Advanced Innovative Technologies* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 1,956.164 | 1,347.956 | 1,133.365 | 730.508 | - | 730.508 | 635.984 | 697.750 | 619.324 | 571.911 | Continuing | Continuing |
| 250: *Advanced Innovative Technologies* | 1,956.164 | 1,324.569 | 1,106.365 | 699.908 | - | 699.908 | 608.984 | 684.250 | 605.824 | 571.911 | Continuing | Continuing |
| 295: *SCO Cyber Efforts* | 0.000 | 23.387 | 27.000 | 30.600 | - | 30.600 | 27.000 | 13.500 | 13.500 | 0.000 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

The Strategic Capabilities Office (SCO) identifies, analyzes, demonstrates, and transitions game-changing applications of existing and near-term technology (and other U.S. Government capabilities) to shape and counter emerging threats. The SCO combines capability innovation with concepts of operation and information management to develop novel concepts solving critical national security challenges in partnership with the Services, Defense Agencies, Combatant Commands (CCMDS), Joint Chiefs of Staff, Intelligence Community, and the Office of the Secretary of Defense (OSD).

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 1,387.539 | 1,312.735 | 818.285 | - | 818.285 |
| Current President's Budget | 1,347.956 | 1,133.365 | 730.508 | - | 730.508 |
| Total Adjustments | -39.583 | -179.370 | -87.777 | - | -87.777 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | -264.370 | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | 85.000 | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | -10.137 | - | | | |
| • SBIR/STTR Transfer | -29.446 | - | | | |
| • Defense-Wide Review Adjustments | - | - | -249.300 | - | -249.300 |
| • Economic Assumption Reduction | - | - | -0.797 | - | -0.797 |
| • Cyber | - | - | 19.000 | - | 19.000 |
| • Classified (1) | - | - | 20.000 | - | 20.000 |
| • Classified (2) | - | - | 130.000 | - | 130.000 |
| • Fiscal Guidance Reduction | - | - | -6.680 | - | -6.680 |

| Congressional Add Details ($ in Millions, and Includes General Reductions) | FY 2019 | FY 2020 |
|---|---|---|
| **Project:** 250: *Advanced Innovative Technologies* | | |
| Congressional Add: *Smarter Machine Learning* | 22.500 | 14.500 |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 4: *Advanced Component Development & Prototypes (ACD&P)* | **R-1 Program Element (Number/Name)**<br>PE 0604250D8Z *I Advanced Innovative Technologies* |

| Congressional Add Details ($ in Millions, and Includes General Reductions) | FY 2019 | FY 2020 |
|---|---|---|
| Congressional Add: *Quartermaster Pathfinder* | 35.000 | - |
| Congressional Add: *Micro Nuclear Reactor Program* | - | 63.000 |
| Congressional Add Subtotals for Project: 250 | 57.500 | 77.500 |
| Congressional Add Totals for all Projects | 57.500 | 77.500 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 4 | R-1 Program Element (Number/Name)<br>PE 0604250D8Z / *Advanced Innovative Technologies* | Project (Number/Name)<br>250 / *Advanced Innovative Technologies* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 250: *Advanced Innovative Technologies* | 1,956.164 | 1,324.569 | 1,106.365 | 699.908 | - | 699.908 | 608.984 | 684.250 | 605.824 | 571.911 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

The Strategic Capabilities Office (SCO) identifies, analyzes, demonstrates, and transitions game-changing applications of existing and near-term technology (and other U.S. Government capabilities) to shape and counter emerging threats. The SCO combines capability innovation with concepts of operation and information management to develop novel concepts solving critical national security challenges in partnership with the Services, Defense Agencies, Combatant Commands (CCMDS), Joint Chiefs of Staff, Intelligence Community, and the Office of the Secretary of Defense (OSD).

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Advanced Navigation | 16.568 | - | - |
| ***Title:*** Alternate Strike | 64.329 | 34.637 | 0.000 |
| ***Description:*** The Alternate Strike program demonstrates feasibility and utility of launching existing/modified weapons from existing launch platforms. This project will retire risks associated with cross platform integration to enable transition of new weapon/system combinations to Service partners. Due to the nature of these projects, specific applications and detailed plans are available at a higher classification level.<br><br>***FY 2020 Plans:***<br>• Complete initial system design.<br><br>***FY 2021 Plans:***<br>No funds are requested in FY 2021.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The decrease of $34.637 million from FY 2020 to FY 2021 is due to due to planned program completion | | | |
| ***Title:*** Angel | 0.000 | 95.000 | 220.000 |
| ***Description:*** Specific applications and detailed plans are available at a higher classification level. This program is a new start in FY 2020.<br><br>***FY 2020 Plans:*** | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604250D8Z / *Advanced Innovative Technologies* | **Project (Number/Name)**<br>250 / *Advanced Innovative Technologies* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Specific applications and detailed plans are available at a higher classification level. This program is a new start in FY 2020.<br>***FY 2021 Plans:***<br>Specific applications and detailed plans are available at a higher classification level.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The increase from FY 2020 to FY 2021 is due to the program plan which is available at a higher classification level. | | | |
| ***Title:*** Aurora<br>***Description:*** The Aurora program provides mission planning and execution aids to support fleet operations. Specific applications and detailed plans are available at a higher classification level.<br>***FY 2020 Plans:***<br>• Complete final integrated architecture design<br>• Develop decision aid model<br>• Develop threat models<br>• Test planning tools<br>***FY 2021 Plans:***<br>• Obtain authority to connect on proper network(s)<br>• Obtain signed Technology Transition Agreement with resource and transition sponsor(s)<br>• Complete intel analysis<br>• Selection of threat models<br>• Begin operationally relevant demonstrations<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The increase of $4.979 million from FY 2020 to FY 2021 is due to an increase in operational testing, design validation and accreditation of system on the appropriate network(s). | 4.078 | 13.921 | 18.900 |
| ***Title:*** Avatar<br>***Description:*** The Avatar program develops enhanced manned-unmanned capabilities. Due to the nature of this project, specific applications and detailed plans are available at a higher classification level.<br>***FY 2020 Plans:***<br>• Continue open systems architecture refinement.<br>• Continue autonomous behavior algorithm refinement<br>• Continue mission and operational effectiveness analysis | 74.561 | 46.100 | 71.400 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604250D8Z / *Advanced Innovative Technologies* | **Project (Number/Name)**<br>250 / *Advanced Innovative Technologies* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| • Continue hardware in the loop testing of prototype manned-unmanned teaming capabilities to confirm design and functionality.<br>• Continue flight demonstration of autonomy behaviors on platforms.<br>• Initiate integration of payloads onto operational platforms.<br>***FY 2021 Plans:***<br>• Continue open systems architecture refinement.<br>• Continue autonomous behavior algorithm refinement Continue mission and operational effectiveness analysis Continue hardware in the loop testing of prototype manned-unmanned teaming capabilities to confirm design and functionality.<br>• Continue flight demonstration of autonomy behaviors on platforms.<br>• Continue integration of payloads onto operational platforms.<br>• Continue Pilot in the Loop simulation testing.<br>• Initiate large scale Manned-Unmanned Teaming demonstration<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The increase of $25.300 million from FY 2020 to FY 2021 is due to increased emphasis on manned-unmanned teaming demonstrations. | | | |
| ***Title:*** Breaker<br>***Description:*** The Breaker demonstration provides Combatant Commanders with long range effects against targets. Due to the nature of these projects, specific applications and detailed plans are available at a higher classification level.<br>***FY 2020 Plans:***<br>• Conduct and complete test equipment upgrades and provide test support.<br>• Conduct and complete system build and checkout and acceptance testing.<br>• Conduct and complete prototype demonstration tests.<br>***FY 2021 Plans:***<br>The decrease of $44.534 million from FY 2020 to FY 2021 is due to program completion in 4Q2020.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Program is complete after FY 2020. | 28.440 | 44.534 | 0.000 |
| ***Title:*** Carnac<br>***Description:*** The Carnac project applies machine learning algorithms and techniques to existing sensors in order to reduce operator workload and data throughput requirements. Due to the nature of this project, specific applications and detailed plans are available at a higher classification. | 17.023 | 20.700 | 6.400 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604250D8Z / *Advanced Innovative Technologies* | **Project (Number/Name)**<br>250 / *Advanced Innovative Technologies* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***FY 2020 Plans:***<br>• Continue data collection activities.<br>• Demonstrate application of machine learning algorithms.<br>• Perform test & evaluation to determine technical and operational effectiveness.<br>***FY 2021 Plans:***<br>• Integration of machine learning algorithms<br>• Conduct prototype demonstration tests<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The decrease of $14.300 million from FY 2020 to FY 2021 is due to the completion of the major development activities for the program and the entry into the final integration and demonstration phase. | | | |
| ***Title:*** CD ATACMS Support<br>***Description:*** These funds support transition of CD ATACMS to the Army.<br>***FY 2020 Plans:***<br>• Support transition of CD ATACMS to the Army.<br>• Initiate hardware/software development for integration into operational Army Command and Control framework.<br>• Initiate program and system engineering activities required for fielded system.<br>***FY 2021 Plans:***<br>No funds are requested in FY 2021<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The decrease of $4.765 million from FY 2020 to FY 2021 is due to completion of program transition. | 15.000 | 4.765 | 0.000 |
| ***Title:*** Chaos<br>***Description:*** The Chaos program provides a novel capability to support ground operations. Specific applications and detailed plans are available at a higher classification level. The Chaos program is a new start in FY 2020.<br>***FY 2020 Plans:***<br>• Complete prototype design<br>• Acquire and repurpose existing hardware<br>***FY 2021 Plans:*** | 0.580 | 13.820 | 17.100 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604250D8Z / *Advanced Innovative Technologies* | **Project (Number/Name)**<br>250 / *Advanced Innovative Technologies* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| • Refine hardware and software modifications based on initial field demonstration results; demonstrate additional capabilities at field sites.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The increase of $3.280 million from FY 2020 to FY 2021 is due to comprehensive hardware and software modifications/ development over the baseline system in response to lessons learned during FY 2020 field demonstrations. | | | |
| ***Title:*** Command and Control of the Information Environment (C2IE)<br><br>***Description:*** The Command and Control of the Information Environment (C2IE) project provides Combatant Commands, Services, Agencies, and Department of Defense leadership the ability to detect, monitor, understand, and act in the information environment. Due to the nature of this project, specific applications and detailed plans are available at a higher classification level. | 25.231 | - | - |
| ***Title:*** Contender<br><br>***Description:*** SCO will develop and demonstrate an operational prototype that will enable more capable weapons system. Due to the nature of this project, specific applications and detailed plans are available at a higher classification level.<br><br>***FY 2020 Plans:***<br>• Complete prototype assemblies and system wide integration.<br>• Complete full scale operational testing.<br><br>***FY 2021 Plans:***<br>No funds are requested in FY 2021.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The decrease of $74.521 million from FY 2020 to FY 2021 is due to program transition to the Navy for the final year of prototype demonstrations. | 76.883 | 22.000 | 0.000 |
| ***Title:*** Eclipse<br><br>***Description:*** The Eclipse program accelerates the maturation and fielding of emerging disruptive technologies. Specific applications and detailed plans are available at a higher classification level. The Eclipse program is a new start in FY 2020.<br><br>***FY 2020 Plans:***<br>• Complete prototype design<br>• Conduct initial test<br><br>***FY 2021 Plans:*** | 3.297 | 15.000 | 30.000 |

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|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604250D8Z / *Advanced Innovative Technologies* | **Project (Number/Name)**<br>250 / *Advanced Innovative Technologies* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| • Continue analysis to define system characteristics and measures of effectiveness<br>• Conduct integrated platform testing in multiple domains and modalities<br>• Complete physical design evaluations and modifications<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The increase of $15.000 million from FY 2020 to FY 2021 is due to an increase in operational testing, design validation and modification, and exploration of operational use in different modalities and domains. | | | |
| ***Title:*** Enhanced Munitions | 26.000 | - | - |
| ***Title:*** Fable<br>***Description:*** Due to the classified nature of this project, specific applications and detailed plans are available at a higher classification level.<br>***FY 2020 Plans:***<br>No funds were requested for this program in FY 2020.<br>***FY 2021 Plans:***<br>Due to the classified nature of this project, specific applications and detailed plans are available at a higher classification level.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Due to the classified nature of this project, specific applications and detailed plans are available at a higher classification level. | 0.000 | 0.000 | 130.000 |
| ***Title:*** Ghost Fleet<br>***Description:*** SCO will develop and demonstrate fleet integrated, operational prototype unmanned maritime vehicles to fill existing mission requirements for Combatant Commanders. Due to the nature of these projects, specific applications and detailed plans are available at a higher classification level.<br>***FY 2020 Plans:***<br>• Complete design for physical modifications of final platforms.<br>• Conduct integration of Government Furnished Equipment.<br>• Complete platform final alterations and sea worthiness validations.<br>• Conduct sea-based experimentation demonstrations.<br>***FY 2021 Plans:*** | 99.543 | 156.600 | 0.000 |

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| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604250D8Z / *Advanced Innovative Technologies* | **Project (Number/Name)**<br>250 / *Advanced Innovative Technologies* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Final capstone demonstrations will occur in FY 2021. Program has been phased to accommodate the delivery schedule and integration of a demonstration payload. Program is complete in FY 2021.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The decrease of $156.600 million from FY 2020 to FY 2021 is due to program completion. | | | |
| ***Title:*** Hypervelocity Gun Weapon System (HGWS)<br>***Description:*** Cost-effective, large magazine point defense will be demonstrated by closing the fire control loop between existing sensors and prototype projectiles launched from existing families of powder guns. Due to the nature of this project, specific applications and detailed plans are available at a higher classification level.<br>***FY 2020 Plans:***<br>• Funding will be used to support the final live-fire demonstration.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The decrease of $2.975 million from FY 2020 to FY 2021 is due to program completion. | 25.786 | 2.975 | - |
| ***Title:*** Hoover<br>***Description:*** The Hoover project applies machine learning algorithms and techniques in order to reduce operator workload and data throughput requirements. Due to the nature of this project, specific applications and detailed plans are available at a higher classification.<br>***FY 2020 Plans:***<br>• Complete design development.<br>• Continue integration activities.<br>• Demonstrate machine learning algorithms in relevant environment.<br>***FY 2021 Plans:***<br>• Continued integration activities<br>• Conduct prototype demonstration tests<br>• Refinement of machine learning algorithms based on feedback during demonstrations<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The decrease of $5.219 million from FY 2020 to FY 2021 is due to the completion of the acquisition of several major hardware components. | 62.300 | 72.000 | 66.781 |
| ***Title:*** Hornet's Nest | 7.722 | 57.800 | 0.000 |

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| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604250D8Z / *Advanced Innovative Technologies* | **Project (Number/Name)**<br>250 / *Advanced Innovative Technologies* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Description:*** The Hornet's Nest program will develop a multi-mission Unmanned Aerial Vehicle (UAV). Due to the nature of these projects, specific applications and detailed plans are available at a higher classification level.<br><br>***FY 2020 Plans:***<br>• Continue modeling and simulation of system.<br>• Conduct system flight demonstration.<br><br>***FY 2021 Plans:***<br>No funds are requested in FY 2021.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Program ends in FY 2020. | | | |
| ***Title:*** Hurt Locker<br><br>***Description:*** The Hurt Locker project demonstrates feasibility and utility of alternative system deployment. This program will retire risks associated with cross platform integration of existing weapons control systems. Due to the nature of this project, specific applications and detailed plans are available at a higher classification.<br><br>***FY 2020 Plans:***<br>• Continue hardware and software system integration.<br>• Complete hardware prototyping.<br>• Conduct full HWIL/SWIL testing.<br>• Conduct study to identify opportunities to rapidly expand system capabilities to support additional mission areas<br><br>***FY 2021 Plans:***<br>• Continue hardware and software system integration spirals.<br>• Conduct system demonstrations to support final design spiral for service transition.<br>• Develop detailed sensor and communication element designs to support prototype development for additional mission areas.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The increase of $5.228 from FY 2020 to FY 2021 is to execute the follow-on design iteration specified in FY 2021 tasking. Additional details available at a higher classification level. | 69.761 | 21.772 | 27.000 |
| ***Title:*** Kingfisher | 24.900 | 25.000 | - |

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| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604250D8Z / *Advanced Innovative Technologies* | **Project (Number/Name)**<br>250 / *Advanced Innovative Technologies* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Description:*** The Kingfisher project will leverage previous investments in maritime systems to demonstrate the feasibility and operational utility of naval weapons. Due to the nature of this project, specific applications and detailed plans are available at a higher classification.<br><br>***FY 2020 Plans:***<br>• Complete subscale and subcomponent test.<br>• Complete detailed weapons design.<br>• Conduct platform integration analysis.<br>• Develop initial SW design and builds.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The decrease of $25.000 million from FY 2020 to FY 2021 is due to program termination as directed by the Defense-Wide review. | | | |
| ***Title:*** LiTE Saber<br><br>***Description:*** The LiTE Saber program will develop and demonstrate a ubiquitous tactical command, control and communication capability in relevant combat environments. Due to the nature of this project, specific applications and detailed plans are available at a higher classification<br><br>***FY 2020 Plans:***<br>• Evaluate and assess design and systems engineering activities in support of system architecture, hardware design and platform integration requirements.<br>• Initiate transition to Program of Record.<br>• Continue open systems architecture refinement.<br>• Continue analysis to define system characteristics and effectiveness.<br>• Complete test plan and final capability demonstration.<br><br>***FY 2021 Plans:***<br>No funds are requested in FY 2021.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The decrease of $35.000 million from FY 2020 to FY 2021 is due to program termination pursuant to the Defense-Wide review. | 43.638 | 35.000 | 0.000 |
| ***Title:*** Maven<br><br>***Description:*** Leverage advanced commercial technologies to provide advantage to the warfighter in contested environments. Due to the nature of some of these projects, specific applications and detailed plans are available at a higher classification level. | 10.385 | 16.200 | 0.000 |

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| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***FY 2020 Plans:***<br>• Continue algorithm development for improved performance.<br>• Perform test & evaluation to determine technical and operational effectiveness.<br>***FY 2021 Plans:***<br>No funds are requested in FY 2021.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Program is complete after FY 2020. | | | |
| ***Title:*** Mission Support<br>***Description:*** These funds provide for building rent, physical security, travel, supplies and equipment, information technology, and contractor support (Systems Engineering and Technical Assistance (SETA)).<br>***FY 2020 Plans:***<br>These funds provide for building rent, physical security, travel, supplies and equipment, information technology, and contractor support (Systems Engineering and Technical Assistance (SETA)).<br>***FY 2021 Plans:***<br>These funds provide for building rent, physical security, travel, supplies and equipment, information technology, and contractor support (Systems Engineering and Technical Assistance (SETA)).<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The decrease of $12.144 million from FY 2020 to FY 2021 is due to overall funding reduction to SCO's topline due to reduced number of programs. | 53.566 | 73.753 | 61.609 |
| ***Title:*** Motley Crew<br>***Description:*** The Motley Crew project will leverage near term technologies being developed to enable higher capability in weapons systems. Due to the nature of this project, specific applications and detailed plans are available at a higher classification level.<br>***FY 2020 Plans:***<br>• Continue refinement of algorithms.<br>• Continue mission and operational effectiveness modeling and simulation.<br>• Execute final demonstration of the system.<br>***FY 2021 Plans:*** | 33.749 | 11.700 | 0.000 |

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| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604250D8Z / *Advanced Innovative Technologies* | **Project (Number/Name)**<br>250 / *Advanced Innovative Technologies* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| No funds are requested in FY 2021.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Program is complete after FY 2020. | | | |
| ***Title:*** Perdix Gen 7<br>***Description:*** Develop next generation micro-UAV (unmanned air vehicle) with improved endurance and processing power to allow for multi-mission capabilities.<br>Due to the nature of this project, specific applications and detailed plans are available at a higher classification level.<br>***FY 2020 Plans:***<br>• Continue iterative flight testing of autonomous airborne capabilities.<br>• Complete mission planning software.<br>• Begin program of record transition activities.<br>• Conduct final prototype flight demonstration in operationally representative environment.<br>***FY 2021 Plans:***<br>No funds are requested in FY 2021.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Program is complete after FY 2020. | 15.351 | 4.800 | 0.000 |
| ***Title:*** Quiet Riot<br>***Description:*** The Quiet Riot project will leverage previous investments to demonstrate the feasibility of providing Combatant Commanders additional options. Due to the nature of this project, specific applications and detailed plans are available at a higher classification.<br>***FY 2020 Plans:***<br>• Initiate system procurement and assembly.<br>• Conduct subsystem testing.<br>• Initiate full scale test planning and coordination.<br>***FY 2021 Plans:***<br>• Finalize system procurement and assembly.<br>• Conduct development for improved performance. | 12.005 | 7.725 | 2.285 |

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| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604250D8Z / *Advanced Innovative Technologies* | **Project (Number/Name)**<br>250 / *Advanced Innovative Technologies* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| • Perform test & evaluation to determine technical and operational effectiveness.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The decrease of $5.440 million from FY 2020 to FY 2021 is due to anticipated completion of test planning and completion of feasibility assessments for certain program sub-elements. Further information available on higher classification system. | | | |
| ***Title:*** Sea Dragon<br><br>***Description:*** A cost-effective capability will be demonstrated by integrating an existing weapon system with an existing platform. Due to the nature of these projects, specific applications and detailed plans are available at a higher classification level.<br><br>***FY 2020 Plans:***<br>• Complete testing in relevant environments.<br>• Complete technical data package for system installation.<br><br>***FY 2021 Plans:***<br>No funds are requested in FY 2021.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The program is complete after FY 2020. | 234.577 | 41.749 | 0.000 |
| ***Title:*** Sea Mob | 0.941 | - | - |
| ***Title:*** Sea Stalker<br><br>***Description:*** The Sea Stalker will leverage existing low-cost, persistent maritime platforms to offer Combatant Commanders immediate options. Due to the nature of these projects, specific applications and detailed plans are available at a higher classification level.<br><br>***FY 2020 Plans:***<br>• Conduct secondary payload integrated test.<br>• Conduct Final Demonstration<br><br>***FY 2021 Plans:***<br>No funds are requested in FY 2021.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Program is complete after FY 2020. | 13.639 | 8.200 | 0.000 |
| ***Title:*** Serenity | 16.669 | 7.475 | 0.000 |

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| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604250D8Z / *Advanced Innovative Technologies* | **Project (Number/Name)**<br>250 / *Advanced Innovative Technologies* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Description:*** The Serenity project will leverage existing technologies to analyze and demonstrate a prototype solution to ensure survivability of U.S. assets. Due to the nature of these projects, specific applications and detailed plans are available at a higher classification level.<br><br>***FY 2020 Plans:***<br>• Environment and operability testing.<br>• System Integration.<br>• Build systems for FY 2021 installation.<br><br>***FY 2021 Plans:***<br>No funds are requested in FY 2021.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Program is complete after FY 2020. | | | |
| ***Title:*** Shawshank<br><br>***Description:*** The Shawshank program provides Special Operations Forces new and enhanced capabilities. Specific applications and detailed plans are available at a higher classification level. The Shawshank program is a new start in FY 2020<br><br>***FY 2020 Plans:***<br>• Complete engineering feasibility<br>• Complete prototype designs<br>• Build and test models<br><br>***FY 2021 Plans:***<br>• Continue engineering feasibility assessments<br>• Model testing and refinement<br>• Acquire/build prototypes<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The decrease of $63.372 million from FY 2020 to FY 2021 is due to anticipated completion of material purchases for certain program sub-elements and completion of engineering feasibility assessments for certain program sub-elements. Further information available on higher classified system. | 10.362 | 108.810 | 45.438 |
| ***Title:*** StormSystem | 9.000 | 4.320 | 2.995 |

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| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604250D8Z / *Advanced Innovative Technologies* | **Project (Number/Name)**<br>250 / *Advanced Innovative Technologies* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Description:*** StormSystem will leverage existing capabilities to develop a suite of tools that disrupts the adversary cyber capabilities. Due to the nature of these projects, specific applications and detailed plans are available at a higher classification level.<br><br>***FY 2020 Plans:***<br>• Complete component integration efforts of component tools into systems.<br>• Establish operational beta test capability at transition partner facilities<br>• Analyze system interoperability at operational locations.<br>• Integrate additional government systems<br><br>***FY 2021 Plans:***<br>Funds are requested to complete integration of components and test the prototype at the transition location.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The decrease of $1.325 million from FY 2020 to FY 2021 is due to planned spiral development of the program. Focus for FY 2020 infrastructure and integration efforts of disparate components shifts to full integration, prototype testing and transition in FY 2021. FY 2021 will complete the testing of outlier components, and primarily focus on the analysis of the system capability and interoperability at the transition partner's location. | | | |
| ***Title:*** Strike-X<br><br>***Description:*** The Strike-X project provides alternatives to deliver near-term innovative strike capabilities to Combatant Commanders. Due to the nature of this project, specific applications and detailed plans are available at a higher classification level.<br><br>***FY 2020 Plans:***<br>No funds were requested in FY 2020.<br><br>***FY 2021 Plans:***<br>No funds are requested in FY 2021.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Program is complete after FY 2019. No funds are requested in FY 2021. | 37.891 | 0.000 | 0.000 |
| ***Title:*** Third Eye<br><br>***Description:*** Third Eye is a data architecture that leverages existing and emerging sensors. Due to the nature of this project, specific applications and detailed plans are available at a higher classification level. | 32.515 | 5.796 | - |

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| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604250D8Z / *Advanced Innovative Technologies* | **Project (Number/Name)**<br>250 / *Advanced Innovative Technologies* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***FY 2020 Plans:***<br>• Continue to update capability based on operator feedback.<br>• Develop limited capability to deploy the target production capability.<br>• Update algorithms and validate through demonstration.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The decrease of $5.796 million from FY 2020 to FY 2021 is due to program completion. | | | |
| ***Title:*** Vanguard<br>***Description:*** The Vanguard project will provide a capability to provide situational awareness across the battle field. Due to the classified nature of this project, specific applications and detailed plans are available at a higher classification level.<br>***FY 2020 Plans:***<br>• Complete full scale test planning and safety coordination.<br>• Continue to analyze system performance and refinement.<br>• Continue full-scale system test.<br>***FY 2021 Plans:***<br>No funds are requested in FY 2021.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>FY 2020 is the last year of funding for this program. | 8.051 | 11.713 | 0.000 |
| ***Title:*** Wildcat<br>***Description:*** The Wildcat project will demonstrate the feasibility and operational utility of enhanced weapon capability. Due to the nature of this project, specific applications and detailed plans are available at a higher classification.<br>***FY 2020 Plans:***<br>• Continue testing of components at high setback.<br>• Continue testing component integration.<br>• Conduct initial integration testing.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The decrease of $45.000 million from FY 2020 to FY 2021 is due to program termination pursuant to the Defense-Wide review. | 92.728 | 45.000 | - |
| **Accomplishments/Planned Programs Subtotals** | 1,267.069 | 1,028.865 | 699.908 |

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| | FY 2019 | FY 2020 |
|---|---|---|
| ***Congressional Add:*** Smarter Machine Learning<br>***FY 2019 Accomplishments:*** FY 2019 Congressional add.<br>***FY 2020 Plans:*** FY 2020 Congressional add. | 22.500 | 14.500 |
| ***Congressional Add:*** Quartermaster Pathfinder<br>***FY 2019 Accomplishments:*** FY 2019 Congressional add. | 35.000 | - |
| ***Congressional Add:*** Micro Nuclear Reactor Program<br>***FY 2020 Plans:*** FY 2020 Congressional add. | - | 63.000 |
| **Congressional Adds Subtotals** | 57.500 | 77.500 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
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| Appropriation/Budget Activity<br>0400 / 4 | R-1 Program Element (Number/Name)<br>PE 0604250D8Z / *Advanced Innovative Technologies* | Project (Number/Name)<br>250 / *Advanced Innovative Technologies* | |

**Product Development ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Advanced Navigation | C/CPIF | Various : Various | - | 16.568 | Oct 2018 | - | | - | | - | | - | Continuing | Continuing | - |
| Alternate Strike | MIPR | Various : Various | 369.538 | 64.329 | Mar 2019 | 34.637 | Aug 2020 | - | | - | | - | Continuing | Continuing | - |
| Angel | C/TBD | Various : Various | - | - | | 95.000 | Apr 2020 | 220.000 | Dec 2020 | - | | 220.000 | Continuing | Continuing | - |
| Aurora | C/TBD | Various : Various | - | 4.078 | Jun 2019 | 13.921 | Dec 2019 | 18.900 | Dec 2020 | - | | 18.900 | Continuing | Continuing | - |
| Avatar | MIPR | Various : Various | 24.395 | 74.561 | Apr 2019 | 46.100 | Dec 2019 | 71.400 | Dec 2020 | - | | 71.400 | Continuing | Continuing | - |
| Breaker | C/CPFF | Various : Various | 46.626 | 28.440 | Jan 2019 | 44.534 | Mar 2020 | - | | - | | - | Continuing | Continuing | - |
| Carnac | MIPR | Various : Various | - | 17.023 | Jan 2019 | 20.700 | Jan 2020 | 6.400 | Jan 2021 | - | | 6.400 | Continuing | Continuing | - |
| CD ATACMS Support | C/Various | Various : Various | - | 15.000 | Dec 2018 | 4.765 | Jan 2020 | - | | - | | - | Continuing | Continuing | - |
| Chaos | C/TBD | Various : Various | - | 0.580 | Aug 2019 | 13.820 | Dec 2019 | 17.100 | Dec 2020 | - | | 17.100 | Continuing | Continuing | - |
| C2IE | MIPR | Various : Various | 110.687 | 25.231 | Dec 2019 | - | | - | | - | | - | Continuing | Continuing | - |
| Contender | MIPR | Various : Various | 103.466 | 76.883 | May 2019 | 22.000 | Nov 2019 | - | | - | | - | Continuing | Continuing | - |
| Eclipse | C/TBD | Various : Various | - | 3.297 | Dec 2019 | 15.000 | Dec 2019 | 30.000 | Apr 2021 | - | | 30.000 | Continuing | Continuing | - |
| Enhanced Munitions | C/CPIF | Various : Various | - | 26.000 | Jan 2019 | - | | - | | - | | - | Continuing | Continuing | - |
| Fable | C/TBD | Various : Various | - | - | | - | | 130.000 | Dec 2020 | - | | 130.000 | Continuing | Continuing | - |
| Ghost Fleet | C/Various | Various : Various | 131.151 | 99.543 | May 2019 | 156.600 | Nov 2019 | - | | - | | - | Continuing | Continuing | - |
| HGWS | C/TBD | Various : Various | - | 25.786 | Nov 2019 | 2.975 | Mar 2020 | - | | - | | - | Continuing | Continuing | - |
| Hoover | MIPR | Various : Various | 46.000 | 62.300 | Apr 2019 | 72.000 | Jan 2020 | 66.781 | Nov 2020 | - | | 66.781 | Continuing | Continuing | - |
| Hornet's Nest | MIPR | Various : Various | 23.419 | 7.722 | Dec 2019 | 57.800 | Jan 2020 | - | | - | | - | Continuing | Continuing | - |
| Hurt Locker | MIPR | Various : Various | 56.200 | 69.761 | Jan 2019 | 21.772 | Jan 2020 | 27.000 | Dec 2020 | - | | 27.000 | Continuing | Continuing | - |
| Kingfisher | MIPR | Various : Various | - | 24.900 | Jan 2019 | 25.000 | Sep 2020 | - | | - | | - | Continuing | Continuing | - |
| LiTE Saber | Various | Various : Various | 63.428 | 43.638 | Jul 2019 | 35.000 | Feb 2020 | - | | - | | - | Continuing | Continuing | - |
| Maven | MIPR | Various, TBD : Various | 15.613 | 10.385 | Apr 2019 | 16.200 | Mar 2020 | - | | - | | - | Continuing | Continuing | - |
| Micro Nuclear Reactor Program | C/TBD | Various : Various | - | - | | 63.000 | Mar 2020 | - | | - | | - | Continuing | Continuing | - |
| Motley Crew | MIPR | Various : Various | 31.226 | 33.749 | Jan 2019 | 11.700 | Jan 2020 | - | | - | | - | Continuing | Continuing | - |
| Perdix Gen 7 | FFRDC | Various : Various | 8.431 | 15.351 | May 2019 | 4.800 | Jan 2020 | - | | - | | - | Continuing | Continuing | - |
| Program Management | C/TBD | Various : Various | - | 53.566 | Oct 2018 | 73.753 | Mar 2020 | 61.609 | Dec 2020 | - | | 61.609 | Continuing | Continuing | - |

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
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| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604250D8Z / *Advanced Innovative Technologies* | **Project (Number/Name)**<br>250 / *Advanced Innovative Technologies* |

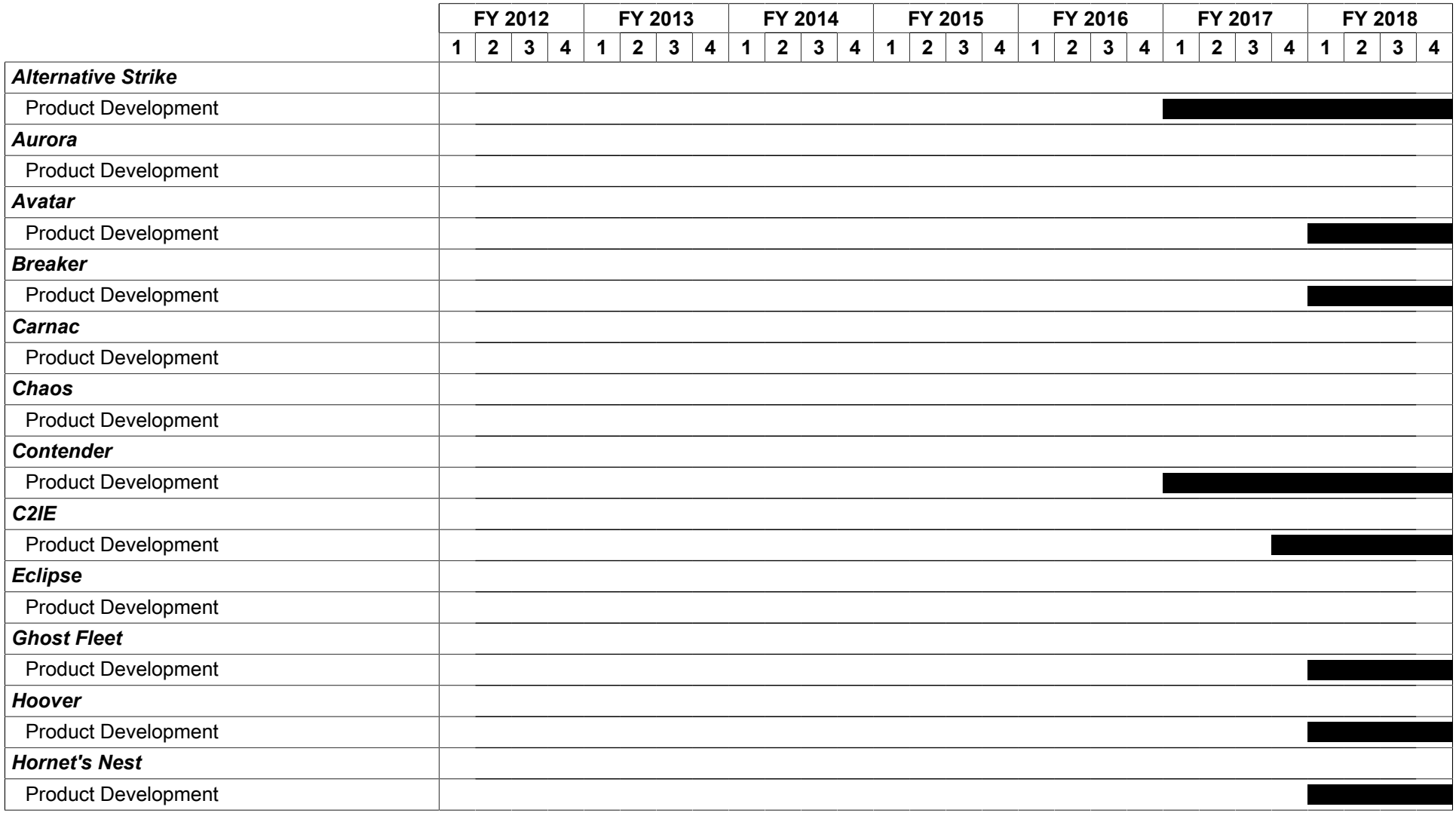
**Product Development ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quiet Riot | MIPR | Various : Various | - | 12.005 | Sep 2019 | 7.725 | Jul 2020 | 2.285 | Dec 2020 | - | | 2.285 | Continuing | Continuing | - |
| Quartermaster Pathfinder | C/TBD | Various : Various | - | 35.000 | Sep 2019 | - | | - | | - | | - | Continuing | Continuing | - |
| Sea Dragon | Various | Various : Various | 509.608 | 234.577 | Jan 2019 | 41.749 | Jan 2020 | - | | - | | - | Continuing | Continuing | - |
| Sea Stalker | MIPR | Various : Various | 69.312 | 13.639 | Apr 2019 | 8.200 | Jan 2020 | - | | - | | - | Continuing | Continuing | - |
| Sea Mob | C/CPIF | Various : Various | - | 0.941 | Oct 2018 | - | | - | | - | | - | Continuing | Continuing | - |
| Serenity | Various | Various : Various | 17.565 | 16.669 | May 2019 | 7.475 | Feb 2020 | - | | - | | - | Continuing | Continuing | - |
| Shawshank | C/TBD | Various : Various | - | 10.362 | Feb 2019 | 108.810 | Mar 2020 | 45.438 | Mar 2021 | - | | 45.438 | Continuing | Continuing | - |
| StormSystem | Various | Various, TBD : Various | 6.831 | 9.000 | Mar 2019 | 4.320 | Oct 2019 | 2.995 | Oct 2020 | - | | 2.995 | Continuing | Continuing | - |
| Smarter Machine Learning | SS/TBD | Various : Various | 24.952 | 22.500 | Mar 2019 | 14.500 | Jan 2020 | - | | - | | - | Continuing | Continuing | - |
| Strike-X | MIPR | Various : Various | 220.826 | 37.891 | Jun 2019 | - | | - | | - | | - | Continuing | Continuing | - |
| Third Eye | MIPR | Various, TBD : Various | 68.596 | 32.515 | May 2019 | 5.796 | Mar 2020 | - | | - | | - | Continuing | Continuing | - |
| Vanguard | C/Various | Various,TBD : Various | 8.294 | 8.051 | Feb 2019 | 11.713 | Feb 2020 | - | | - | | - | Continuing | Continuing | - |
| Wildcat | MIPR | Various, TBD : Various | - | 92.728 | Feb 2019 | 45.000 | Jan 2020 | - | | - | | - | Continuing | Continuing | - |
| | | **Subtotal** | 1,956.164 | 1,324.569 | | 1,106.365 | | 699.908 | | - | | 699.908 | Continuing | Continuing | N/A |

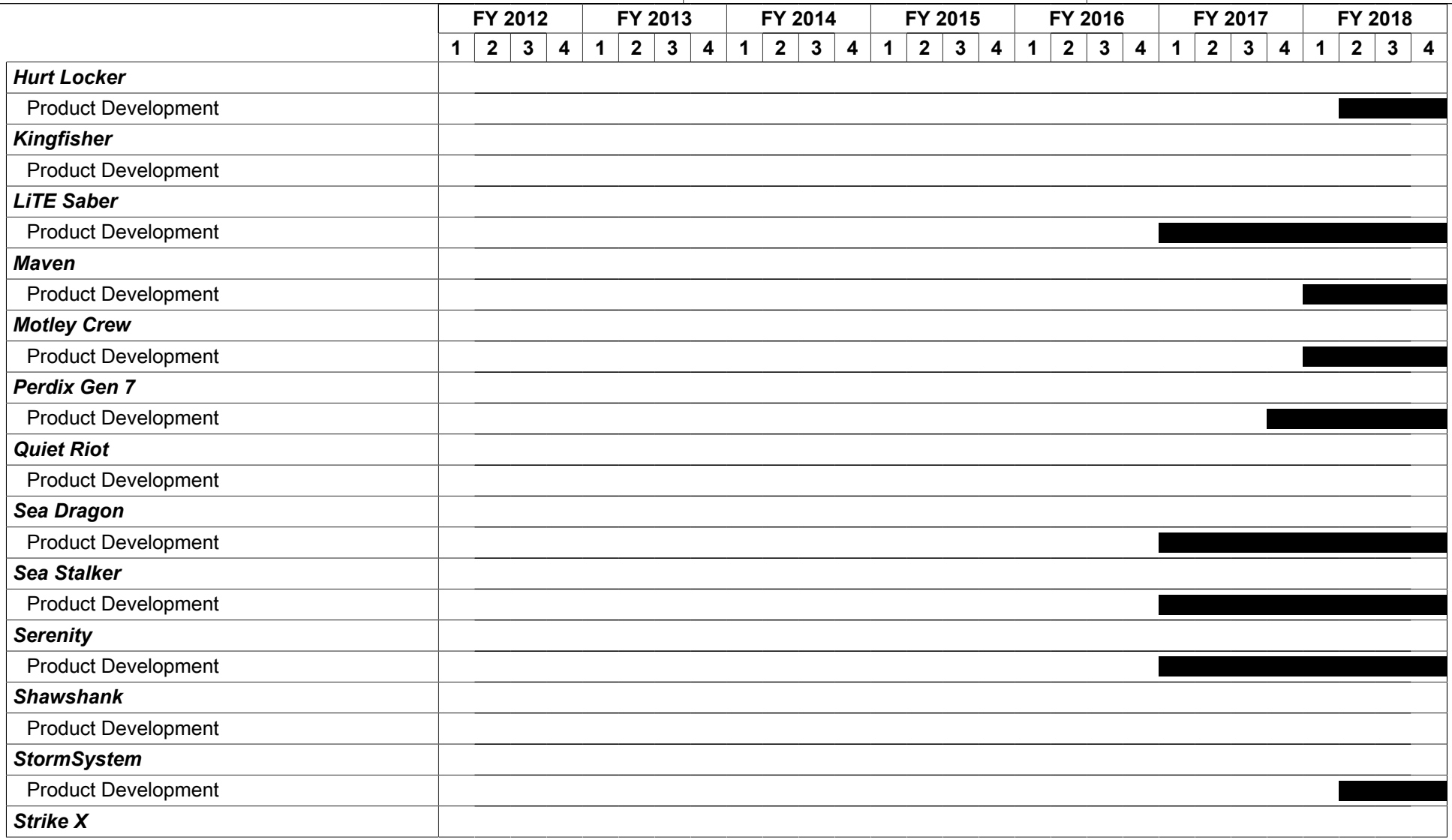
| | Prior Years | FY 2019 | | FY 2020 | | FY 2021 Base | | FY 2021 OCO | | FY 2021 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | 1,956.164 | 1,324.569 | | 1,106.365 | | 699.908 | | - | | 699.908 | Continuing | Continuing | N/A |

**Remarks**

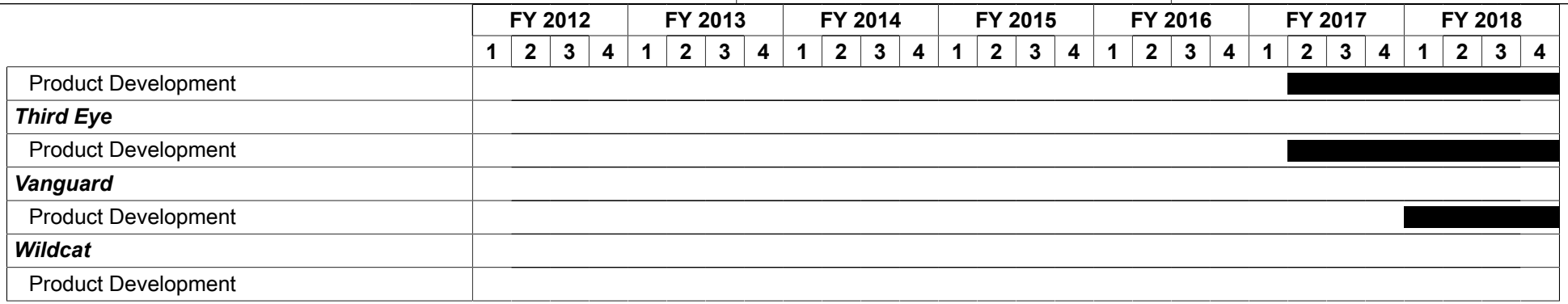
| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604250D8Z / *Advanced Innovative Technologies* | **Project (Number/Name)**<br>250 / *Advanced Innovative Technologies* |

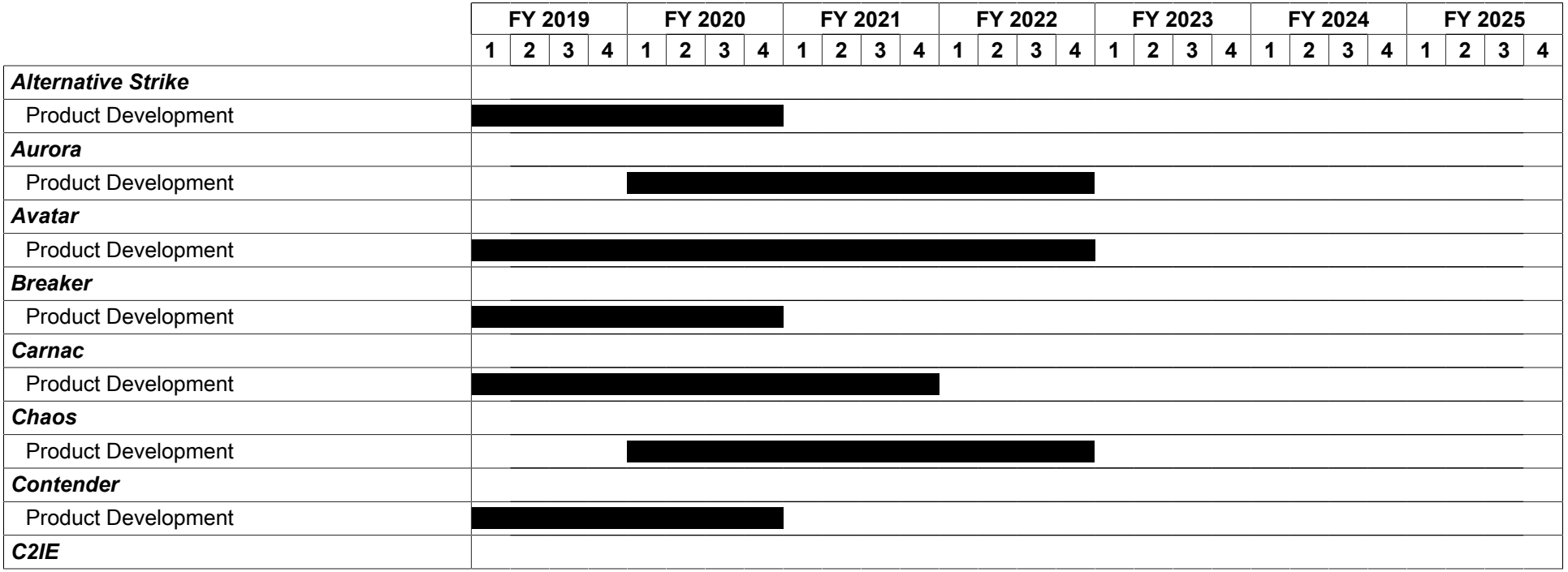


| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604250D8Z / *Advanced Innovative Technologies* | **Project (Number/Name)**<br>250 / *Advanced Innovative Technologies* |



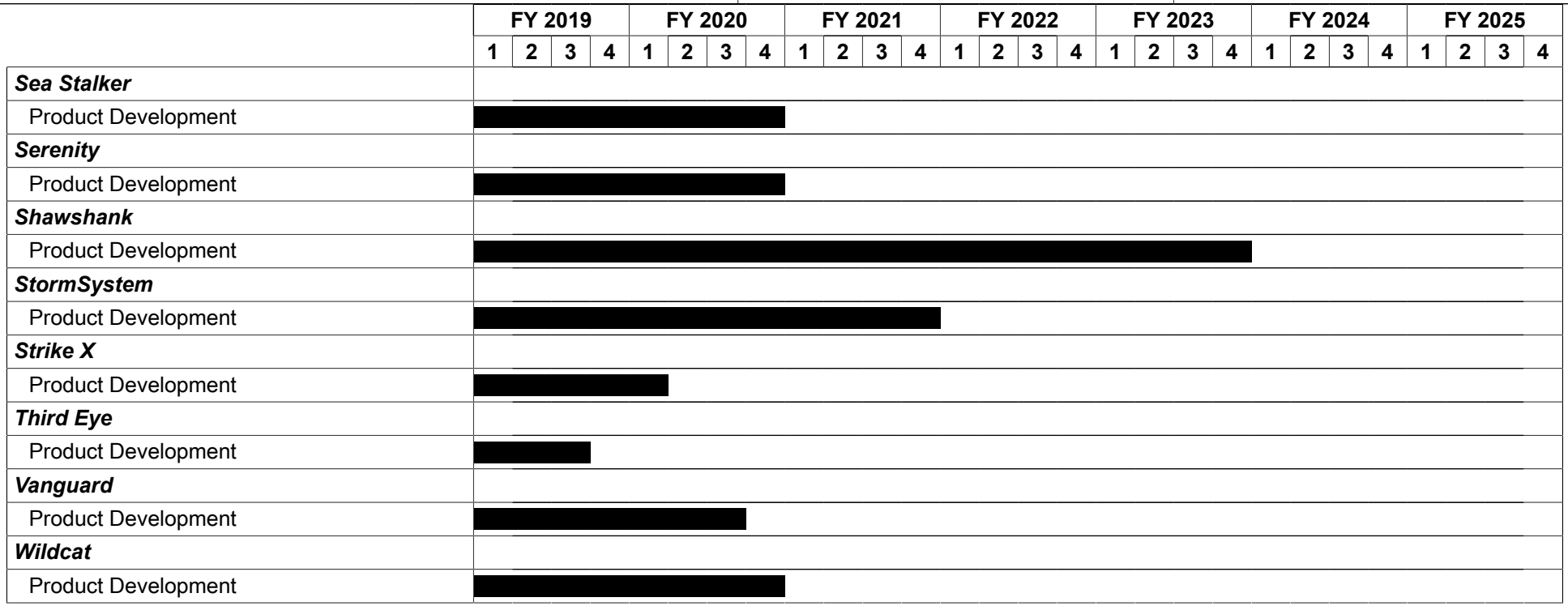
| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604250D8Z / *Advanced Innovative Technologies* | **Project (Number/Name)**<br>250 / *Advanced Innovative Technologies* |



| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604250D8Z / *Advanced Innovative Technologies* | **Project (Number/Name)**<br>250 / *Advanced Innovative Technologies* |

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604250D8Z / *Advanced Innovative Technologies* | **Project (Number/Name)**<br>250 / *Advanced Innovative Technologies* |



| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604250D8Z / *Advanced Innovative Technologies* | **Project (Number/Name)**<br>250 / *Advanced Innovative Technologies* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***Alternative Strike*** | | | | |
| Product Development | 1 | 2017 | 4 | 2020 |
| ***Aurora*** | | | | |
| Product Development | 1 | 2020 | 4 | 2022 |
| ***Avatar*** | | | | |
| Product Development | 1 | 2018 | 4 | 2022 |
| ***Breaker*** | | | | |
| Product Development | 1 | 2018 | 4 | 2020 |
| ***Carnac*** | | | | |
| Product Development | 1 | 2019 | 4 | 2021 |
| ***Chaos*** | | | | |
| Product Development | 1 | 2020 | 4 | 2022 |
| ***Contender*** | | | | |
| Product Development | 1 | 2017 | 4 | 2020 |
| ***C2IE*** | | | | |
| Product Development | 4 | 2017 | 4 | 2018 |
| ***Eclipse*** | | | | |
| Product Development | 1 | 2020 | 4 | 2022 |
| ***Ghost Fleet*** | | | | |
| Product Development | 1 | 2018 | 4 | 2020 |
| ***Hoover*** | | | | |
| Product Development | 1 | 2018 | 4 | 2022 |

| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604250D8Z / *Advanced Innovative Technologies* | **Project (Number/Name)**<br>250 / *Advanced Innovative Technologies* |

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***Hornet's Nest*** | | | | |
| Product Development | 1 | 2018 | 4 | 2020 |
| ***Hurt Locker*** | | | | |
| Product Development | 2 | 2018 | 4 | 2020 |
| ***Kingfisher*** | | | | |
| Product Development | 1 | 2019 | 4 | 2020 |
| ***LiTE Saber*** | | | | |
| Product Development | 1 | 2017 | 3 | 2020 |
| ***Maven*** | | | | |
| Product Development | 1 | 2018 | 3 | 2020 |
| ***Motley Crew*** | | | | |
| Product Development | 1 | 2018 | 4 | 2020 |
| ***Perdix Gen 7*** | | | | |
| Product Development | 4 | 2017 | 4 | 2020 |
| ***Quiet Riot*** | | | | |
| Product Development | 1 | 2019 | 4 | 2022 |
| ***Sea Dragon*** | | | | |
| Product Development | 1 | 2017 | 4 | 2020 |
| ***Sea Stalker*** | | | | |
| Product Development | 1 | 2017 | 4 | 2020 |
| ***Serenity*** | | | | |
| Product Development | 1 | 2017 | 4 | 2020 |
| ***Shawshank*** | | | | |
| Product Development | 1 | 2019 | 4 | 2023 |
| ***StormSystem*** | | | | |

| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604250D8Z / *Advanced Innovative Technologies* | **Project (Number/Name)**<br>250 / *Advanced Innovative Technologies* |

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| Product Development | 2 | 2018 | 4 | 2021 |
| ***Strike X*** | | | | |
| Product Development | 2 | 2017 | 1 | 2020 |
| ***Third Eye*** | | | | |
| Product Development | 2 | 2017 | 3 | 2019 |
| ***Vanguard*** | | | | |
| Product Development | 1 | 2018 | 3 | 2020 |
| ***Wildcat*** | | | | |
| Product Development | 1 | 2019 | 4 | 2020 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 4 | R-1 Program Element (Number/Name)<br>PE 0604250D8Z / *Advanced Innovative Technologies* | Project (Number/Name)<br>295 / *SCO Cyber Efforts* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 295: *SCO Cyber Efforts* | 0.000 | 23.387 | 27.000 | 30.600 | - | 30.600 | 27.000 | 13.500 | 13.500 | 0.000 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

The Strategic Capabilities Office (SCO) identifies, analyzes, demonstrates, and transitions game-changing applications of existing and near-term technology (and other U.S. Government capabilities) to shape and counter emerging threats. The SCO combines capability innovation with concepts of operation and information management to develop novel concepts solving critical national security challenges in partnership with the Services, Defense Agencies, Combatant Commands (CCMDS), Joint Chiefs of Staff, Intelligence Community, and the Office of the Secretary of Defense (OSD).

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Ike | 23.387 | 27.000 | 30.600 |
| ***Description:*** The Ike program provides a joint cyber platform. Specific applications and detailed plans are available at a higher classification level. The Ike program was a new start in FY 2019.<br><br>***FY 2020 Plans:***<br>• Complete architecture design<br>• Integrate collection data<br>• Build and test analysis models<br>• Mature mission management and program integration Build and test analysis models<br><br>***FY 2021 Plans:***<br>• Mature training modules and CONOPS<br>• Integrate into current Program of Record Deploy to Cyber Mission Force<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The increase of $3.600 million from FY 2020 to FY 2021 is to continue prototyping at an increased scale. The funds will be used to mature Ike from a development, security, operations state to a Program of Record by FY 2022. | | | |
| **Accomplishments/Planned Programs Subtotals** | 23.387 | 27.000 | 30.600 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604250D8Z / *Advanced Innovative Technologies* | **Project (Number/Name)**<br>295 / *SCO Cyber Efforts* |

**D. Acquisition Strategy**

N/A

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604250D8Z / *Advanced Innovative Technologies* | **Project (Number/Name)**<br>295 / *SCO Cyber Efforts* |

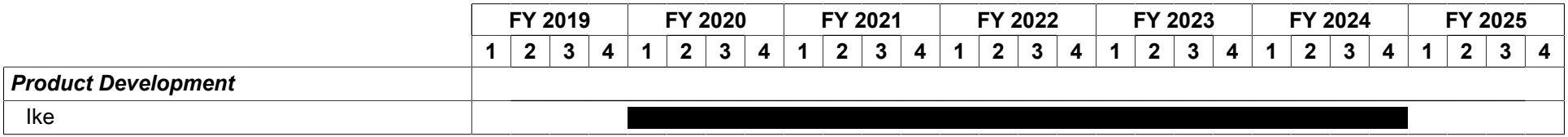
**Product Development ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ike | C/TBD | Various : Various | - | 23.387 | | 27.000 | Dec 2019 | 30.600 | Dec 2020 | - | | 30.600 | Continuing | Continuing | - |
| | | **Subtotal** | - | 23.387 | | 27.000 | | 30.600 | | - | | 30.600 | Continuing | Continuing | N/A |

| | Prior Years | FY 2019 | | FY 2020 | | FY 2021 Base | | FY 2021 OCO | | FY 2021 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | - | 23.387 | | 27.000 | | 30.600 | | - | | 30.600 | Continuing | Continuing | N/A |

**Remarks**

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604250D8Z / *Advanced Innovative Technologies* | **Project (Number/Name)**<br>295 / *SCO Cyber Efforts* |



| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604250D8Z / *Advanced Innovative Technologies* | **Project (Number/Name)**<br>295 / *SCO Cyber Efforts* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***Product Development*** | | | | |
| Ike | 1 | 2020 | 4 | 2024 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | | | | | | | | | | | Date: February 2020 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Appropriation/Budget Activity<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 4: *Advanced Component Development & Prototypes (ACD&P)* | | | | | R-1 Program Element (Number/Name)<br>PE 0604294D8Z / *Trusted and Assured Microelectronics* | | | | | | | |
| **COST ($ in Millions)** | **Prior Years** | **FY 2019** | **FY 2020** | **FY 2021 Base** | **FY 2021 OCO** | **FY 2021 Total** | **FY 2022** | **FY 2023** | **FY 2024** | **FY 2025** | **Cost To Complete** | **Total Cost** |
| Total Program Element | 147.481 | 517.356 | 547.421 | 489.076 | - | 489.076 | 519.140 | 344.311 | 250.567 | 255.659 | Continuing | Continuing |
| 291: *Joint Federated Assurance Center* | 0.000 | 12.000 | 5.887 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| 645: *Verification & Validation (V&V) Capabilities and Standards for Trust* | 147.481 | 41.355 | 44.117 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| 646: *New Trust Approach Development* | 0.000 | 40.023 | 38.247 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| 647: *Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) Innovation and Development* | 0.000 | 423.978 | 459.170 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| 907: *Access to State-of-the-Art (SOTA) Microelectronics - Development* | 0.000 | 0.000 | 0.000 | 281.594 | - | 281.594 | 294.701 | 183.024 | 120.543 | 122.989 | Continuing | Continuing |
| 908: *Access to Advanced Packaging and Testing - Demonstration* | - | 0.000 | 0.000 | 81.438 | - | 81.438 | 98.075 | 29.702 | 0.000 | 0.000 | Continuing | Continuing |
| 911: *Address DoD Unique Needs Especially Radiation Hardening - Development* | - | 0.000 | 0.000 | 50.500 | - | 50.500 | 47.000 | 61.000 | 57.000 | 58.160 | Continuing | Continuing |
| 912: *Create a Resilient and Robust Microelectronics Pipeline* | 0.000 | 0.000 | 0.000 | 75.544 | - | 75.544 | 79.364 | 70.585 | 73.024 | 74.510 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

This Program Element (PE) supports microelectronics modernization activities that enable defense systems to keep pace with commercial microelectronics technological advances, reduce reliance on obsolete microelectronics, and mitigate the Department's reliance on sole source foundries for assured state-of-the-art (SOTA) microelectronics. It addresses the challenges of 1) having enduring access to a multiplicity of modern manufacturing processes that require commercial volumes to maintain long term viability and 2) protecting the intellectual property (IP) of the microelectronic parts that are manufactured.

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 4: *Advanced Component Development & Prototypes (ACD&P)* | **R-1 Program Element (Number/Name)**<br>PE 0604294D8Z *I Trusted and Assured Microelectronics* |

This PE supports the 2018 National Defense Strategy's (NDS) line of effort to build a more lethal force through modernization of key capabilities, the NDS defense objective of establishing an unmatched twenty-first century National Security Innovation Base that effectively supports Department operations and sustains security and solvency, and the NDS strategic approach of reforming the Department's business practices by simultaneously increasing performance and affordability while still minimizing risk.

This PE supports the OUSD(R&E) Microelectronics Modernization Roadmap. The primary areas of focus of this roadmap include the following: access to advanced packaging and test; quantifiable assurance and secure design; foundry access; verification and validation; policies, standards, and Joint Federated Assurance Center (JFAC) governing body; access to radiation hardened microelectronics; access to non-complementary metal oxide semiconductor (CMOS) state-of-the-art (SOTA) microelectronics; disruptive research and development; education and workforce development; trusted foundry and obsolescence; and supply chain awareness and security.

Recognizing that an assured supply of microelectronics is a U.S. Government (USG)-wide concern, this activity will interface with interagency partners to take into account interagency requirements, opportunities for collaboration, and strategic decisions that can be made to limit the overall cost of these requirements to the USG.

This activity is being led by the Under Secretary of Defense for Research and Engineering.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 522.950 | 542.421 | 232.447 | - | 232.447 |
| Current President's Budget | 517.356 | 547.421 | 489.076 | - | 489.076 |
| Total Adjustments | -5.594 | 5.000 | 256.629 | - | 256.629 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | 5.000 | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | -5.503 | - | | | |
| • Other Adjustment | -0.091 | - | -1.899 | - | -1.899 |
| • Economic Assumption | - | - | -0.222 | - | -0.222 |
| • Increase for Access to SOTA Quantifiably Assured Microelectronics | - | - | 258.750 | - | 258.750 |

| Congressional Add Details ($ in Millions, and Includes General Reductions) | FY 2019 | FY 2020 |
|---|---|---|
| **Project:** 291: *Joint Federated Assurance Center* | | |
| Congressional Add: *Joint Federated Assurance Center* | 10.000 | - |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 4: *Advanced Component Development & Prototypes (ACD&P)* | **R-1 Program Element (Number/Name)**<br>PE 0604294D8Z *I Trusted and Assured Microelectronics* |

| Congressional Add Details ($ in Millions, and Includes General Reductions) | FY 2019 | FY 2020 |
|---|---|---|
| Congressional Add Subtotals for Project: 291 | 10.000 | - |
| **Project:** 645: *Verification & Validation (V&V) Capabilities and Standards for Trust* | | |
| Congressional Add: *Supply Chain Risk Management* | - | 5.000 |
| Congressional Add Subtotals for Project: 645 | - | 5.000 |
| **Project:** 647: *Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) Innovation and Development* | | |
| Congressional Add: *Next Generation Microelectronics* | 281.000 | - |
| Congressional Add Subtotals for Project: 647 | 281.000 | - |
| Congressional Add Totals for all Projects | 291.000 | 5.000 |

**Change Summary Explanation**

In FY 2021 Program Element (PE) funding for Project 291 – “Joint Federated Assurance Center”, Project 645 – “Verification and Validation Capabilities and Standards for Trust”, Project 646 – “New Trust Approach Development”, and Project 647 -“Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC)” will realign under four new project codes to correctly align PE funding in support of a zero-trust philosophy and reflective of current priorities. The new project codes are: (1) P907 Access to State-of-the-Art (SOTA) Microelectronics - Development; (2) P908 Access to Advanced Packaging and Testing - Development; (3) P911 Address DoD Unique Needs Especially Radiation Hardening - Development; and (4) P912 Create a Resilient and Robust Microelectronics Pipeline - Development.

Project codes P291, P645, P646, and P647 are being realigned in FY 2021 to the four new project codes to refocus the PE and provide traceability to the current enhancement priorities of SOTA access, heterogeneous packaging, quantifiable assurance, DoD unique needs, and enhanced U.S. microelectronics dominance.

FY 2019 funding in the amount of $291.000 million was added by Congress to support acceleration efforts for MINSEC, Joint Federated Assurance Center (JFAC), and strategic radiation-hardening activities. In FY 2020, $302.000 million was added to accelerate activities for providing access and assurance to domestic SOTA and advanced packaging microelectronics production capabilities under Project 647. FY 2020 funding in the amount of $5.000 million was added by Congress to support supply chain risk management (SCRM) efforts under Project 645.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 4 | R-1 Program Element (Number/Name)<br>PE 0604294D8Z / *Trusted and Assured Microelectronics* | Project (Number/Name)<br>291 / *Joint Federated Assurance Center* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 291: *Joint Federated Assurance Center* | 0.000 | 12.000 | 5.887 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

This project funds the operation software and hardware assurance(SwA and HwA) support to DoD programs and organizations of the Joint Federated Assurance Center (JFAC), established in National Defense Authorization Act (NDAA) Sec 937, to increase DoD's SwA and HwA by providing engineering tools, technical services, best-practices, innovative technologies and other assistance to programs to detect, assess, prioritize, and mitigate vulnerabilities from malicious software and hardware attacks and assurance against supply chain exploitation vulnerabilities. The JFAC will provide capabilities for programs to keep assessment findings throughout the life cycle of their systems for data mining (e.g., documentation on rationale for previous mitigation decisions). The collaboration between the JFAC and program offices will help mitigate existing and emerging critical threats and vulnerabilities in software and hardware available to all DoD programs.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Joint Federated Assurance Center (JFAC) | 2.000 | 5.887 | - |
| ***Description:*** This project's activities will enhance the use of software, hardware, and firmware assurance tools, techniques, and procedures directly with programs and organizations, throughout the life cycle. JFAC provides a common forum in DoD for assurance best practices, community dialog on assurance, access to new technology and tools usable by programs throughout their life cycle for maintaining quantifiable assurance data.<br><br>***FY 2020 Plans:***<br>• Maintain JFAC service infrastructure enabling the centralized assurance repository, assurance contract language, metrics, software assurance tool license distribution, help-desk, hard problem analysis for all DoD programs and organizations.<br>• Incorporate Science & Technology, Defense Advanced Research Projects Agency, Intelligence Advanced Research Projects Activity, Defense Innovation Unit, and Software Engineering Institute products for direct access by programs.<br>• Develop best practices and relationships with industry.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funds transferred from this Project code (Pcode) to the new Pcode for "P907: Access to State-of-the-Art (SOTA) Microelectronics Development". | | | |
| **Accomplishments/Planned Programs Subtotals** | 2.000 | 5.887 | - |

| | FY 2019 | FY 2020 |
|---|---|---|
| ***Congressional Add:*** Joint Federated Assurance Center | 10.000 | - |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>291 / *Joint Federated Assurance Center* |

| | FY 2019 | FY 2020 |
|---|---|---|
| ***FY 2019 Accomplishments:*** • Expanded JFAC capabilities to more effectively identify and mitigate software and hardware cyber security vulnerabilities in DoD weapons systems and networks.<br>• Enabled JFAC to develop offense-defense interaction analytical capabilities to investigate a variety of threat capabilities and assess resulting system and network vulnerabilities.<br>• In a joint Service context, enabled JFAC to conduct advanced scientific research to identify and mitigate cyber threats to software and hardware in DoD weapons systems and networks. | | |
| **Congressional Adds Subtotals** | 10.000 | - |

**C. Other Program Funding Summary ($ in Millions)**

| Line Item | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|
| • O&M (CIVPAY): *0303140D8Z* | 0.000 | 1.113 | - | - | - | - | - | - | - | Continuing | Continuing |

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>291 / *Joint Federated Assurance Center* |

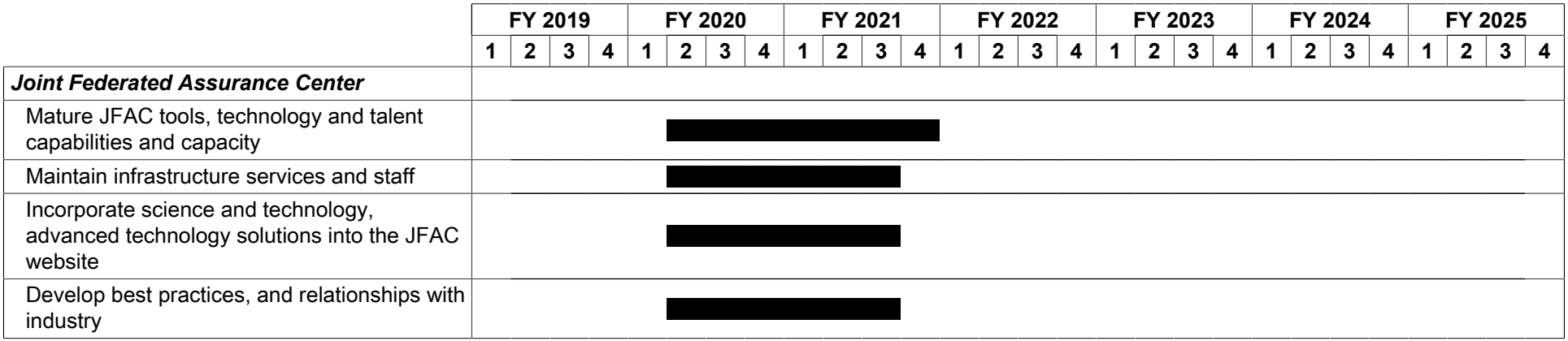
**Product Development ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Joint Federated Assurance Center | MIPR | Army, Navy, Air Force : Various | - | 12.000 | Jan 2019 | 5.887 | Jan 2020 | - | | - | | - | Continuing | Continuing | 2.000 |
| | | **Subtotal** | - | 12.000 | | 5.887 | | - | | - | | - | Continuing | Continuing | N/A |

| | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | - | 12.000 | | 5.887 | | - | | - | | - | Continuing | Continuing | N/A |

**Remarks**

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>291 / *Joint Federated Assurance Center* |



| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>291 / *Joint Federated Assurance Center* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***Joint Federated Assurance Center*** | | | | |
| Mature JFAC tools, technology and talent capabilities and capacity | 2 | 2020 | 4 | 2021 |
| Maintain infrastructure services and staff | 2 | 2020 | 3 | 2021 |
| Incorporate science and technology, advanced technology solutions into the JFAC website | 2 | 2020 | 3 | 2021 |
| Develop best practices, and relationships with industry | 2 | 2020 | 3 | 2021 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 4 | R-1 Program Element (Number/Name)<br>PE 0604294D8Z / *Trusted and Assured Microelectronics* | Project (Number/Name)<br>645 / *Verification & Validation (V&V) Capabilities and Standards for Trust* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 645: *Verification & Validation (V&V) Capabilities and Standards for Trust* | 147.481 | 41.355 | 44.117 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

This project improves microelectronics test and verification methodologies in support of quantifying and verifying the trust and assurance of parts and develops standards and practices to foster commercial development of secure, trusted and assured parts. Verification and test technologies are required to provide direct program support for microelectronics assurance verification. Out-year demands will require an increase in capacity, which will take the form of additional personnel and/or equipment to permit scaling of microelectronics assessment capabilities. Challenges have been identified, to include the ability to analyze leading-edge technology nodes (<32 nanometers (nm)), throughput/time required for analysis, ability to analyze third-party intellectual property (IP) contained in microelectronic components, and analysis of non-application specific integrated circuit (ASIC) components that are increasingly being used for agility, e.g., Field-Programmable Gate Arrays (FPGAs). This project addresses these gaps in current technical capabilities as required to meet the realized and projected out-year demand for core Trusted & Assured Microelectronics laboratory services. Three capability areas core to microelectronics analysis and verification will be improved:

- Physical verification, i.e., destructive analysis of integrated circuits and printed circuit boards.
- Functional analysis, i.e., non-destructive screening/verification of select, critical parts.
- Design verification, i.e., verification/assurance of designs, IP, netlists, bitstreams, firmware, etc.

These improvements address two primary attributes: (1) technical capability including laboratory equipment, IP, analysis tools, such as imaging software, and highly skilled tradecraft, and (2) the capacity to perform microelectronics assessments and quantify assurance.

This project develops and matures assurance mitigations, quantitatively evaluates the effectiveness of protections of IP in support of confidentiality and integrity, and develops and validates obfuscation and disaggregation technologies. The project will address physical validation tool and capability development, design software validation tool development, counterfeit detection and imaging techniques, system vulnerability assessments, testbeds, and distributed data source availability to demonstrate and operationalize full lifecycle data driven quantifiable assurance.

This project also develops standards and practices in support of assured designs, supply chains and formal relationships with industry.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Verification & Validation (V&V) Capabilities and Standards for Trust | 41.355 | 39.117 | - |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>645 / *Verification & Validation (V&V) Capabilities and Standards for Trust* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Description:*** The JFAC DoD core Trusted and Assured Microelectronics (T&AM) laboratories and industry partners will (1) improve microelectronics test and verification methodologies in support of data driven verification of confidentiality, integrity, and authenticity of parts and (2) develop standards/practices to foster commercial development of quantifiably assured parts.<br><br>***FY 2020 Plans:***<br>Continuation of FY 2019 verification and test technologies activities including:<br>• Improvements to core laboratories (1) technical capability, through the procurement of equipment, intellectual property (IP), analysis tools, such as imaging software, and highly skilled tradecraft, and (2) capacity to perform microelectronics assessments. FY 2019 and out-year demands will require an increase in capacity supporting weapon system program engagement, which will take the form of additional personnel and/or equipment to permit scaling of assessment capabilities.<br>• Testing in support of radiation hardened by design (RHBD) and radiation hardened by process (RHBP) initiatives.<br>• Enhancement of automation and standard processes needed to increase the throughput of information produced by individual laboratory tools as well as to facilitate information sharing across the families of tools used for analysis and testing.<br>• Research into qualification concerns regarding access to DoD unique needs from state-of-the-art (SOTA) and state of the practice (SOTP) foundries.<br>• Development of industry standards identifying and addressing gaps in definition and criteria, and establishing accepted levels of supplier and part assurance and operational security per FY 2020 NDAA committee report Section 224.<br><br>Continuation of FY 2019 standards and practices activities.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Project Code (Pcode) 645 funds will transfer from this Pcode to two new Pcodes for “Access to SOTA Microelectronics” and “Create a Resilient and Robust Microelectronics Pipeline” to properly align PE funding in support of the zero-trust philosophy and reflect current priorities. Total funding between the two years will decrease from $44.117 million to $33.686 million with $31.686 million transferring to Access to SOTA and $2.000 million transferring to Create a Resilient and Robust Microelectronics Pipeline. | | | |
| **Accomplishments/Planned Programs Subtotals** | 41.355 | 39.117 | - |

| | FY 2019 | FY 2020 |
|---|---|---|
| ***Congressional Add:*** Supply Chain Risk Management | - | 5.000 |
| ***FY 2020 Plans:*** • Align DoD Instruction 5200.44 (Protection of Mission Critical Functions to Achieve Trusted Systems and Networks (TSN)), and other related policies and guidance, with other USG, e.g., National Institute of Standards and Technology (NIST) 800-161 (Supply Chain Risk Management Practices for Federal Information Systems and Organizations). | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>645 / *Verification & Validation (V&V) Capabilities and Standards for Trust* |

| | FY 2019 | FY 2020 |
|---|---|---|
| • Develop industry standards identifying and addressing gaps in definition and criteria, and establish accepted levels of supplier and part assurance and operational security per FY 2020 NDAA committee report Section 224. | | |
| **Congressional Adds Subtotals** | - | 5.000 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

N/A

**D. Acquisition Strategy**

NA

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>645 / *Verification & Validation (V&V) Capabilities and Standards for Trust* |

**Product Development ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| V&V Capabilities and Standards for Trust | MIPR | Various (Air Force, Army, Navy, National Security Agency) : Various | 147.481 | 41.355 | Mar 2019 | 44.117 | Mar 2020 | - | | - | | - | Continuing | Continuing | - |
| | | **Subtotal** | 147.481 | 41.355 | | 44.117 | | - | | - | | - | Continuing | Continuing | N/A |

**Remarks**

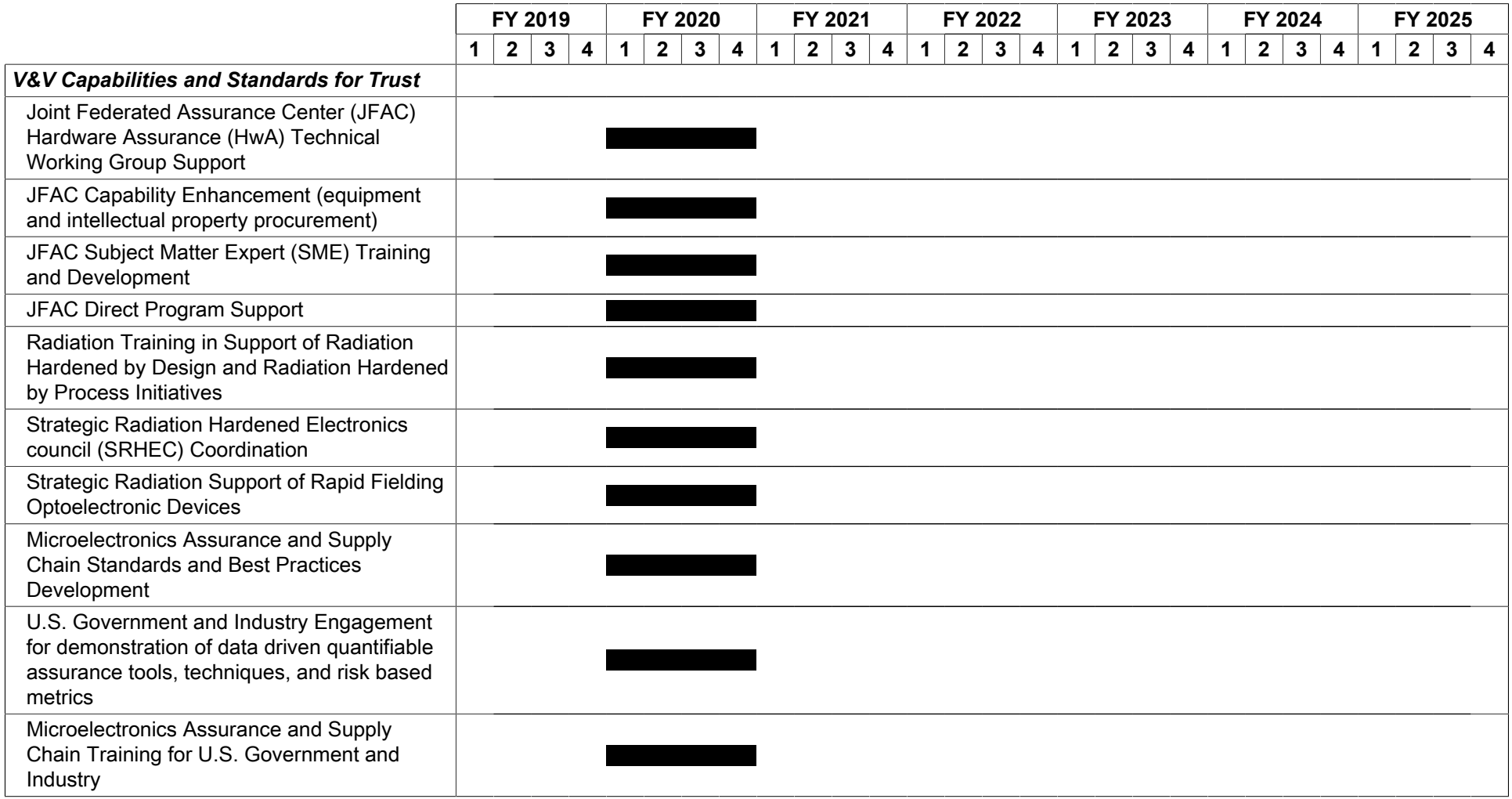
N/A

| | Prior Years | FY 2019 | | FY 2020 | | FY 2021 Base | | FY 2021 OCO | | FY 2021 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | 147.481 | 41.355 | | 44.117 | | - | | - | | - | Continuing | Continuing | N/A |

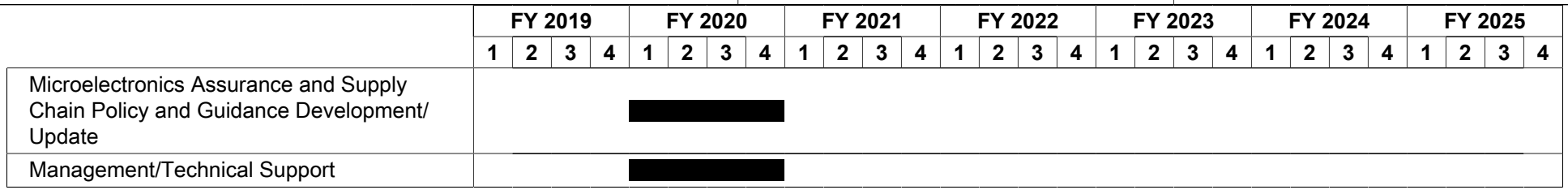
**Remarks**

NA

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>645 / *Verification & Validation (V&V) Capabilities and Standards for Trust* | |



| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>645 / *Verification & Validation (V&V) Capabilities and Standards for Trust* |



| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>645 / *Verification & Validation (V&V) Capabilities and Standards for Trust* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***V&V Capabilities and Standards for Trust*** | | | | |
| Joint Federated Assurance Center (JFAC) Hardware Assurance (HwA) Technical Working Group Support | 1 | 2020 | 4 | 2020 |
| JFAC Capability Enhancement (equipment and intellectual property procurement) | 1 | 2020 | 4 | 2020 |
| JFAC Subject Matter Expert (SME) Training and Development | 1 | 2020 | 4 | 2020 |
| JFAC Direct Program Support | 1 | 2020 | 4 | 2020 |
| Radiation Training in Support of Radiation Hardened by Design and Radiation Hardened by Process Initiatives | 1 | 2020 | 4 | 2020 |
| Strategic Radiation Hardened Electronics council (SRHEC) Coordination | 1 | 2020 | 4 | 2020 |
| Strategic Radiation Support of Rapid Fielding Optoelectronic Devices | 1 | 2020 | 4 | 2020 |
| Microelectronics Assurance and Supply Chain Standards and Best Practices Development | 1 | 2020 | 4 | 2020 |
| U.S. Government and Industry Engagement for demonstration of data driven quantifiable assurance tools, techniques, and risk based metrics | 1 | 2020 | 4 | 2020 |
| Microelectronics Assurance and Supply Chain Training for U.S. Government and Industry | 1 | 2020 | 4 | 2020 |
| Microelectronics Assurance and Supply Chain Policy and Guidance Development/ Update | 1 | 2020 | 4 | 2020 |
| Management/Technical Support | 1 | 2020 | 4 | 2020 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 4 | R-1 Program Element (Number/Name)<br>PE 0604294D8Z / *Trusted and Assured Microelectronics* | Project (Number/Name)<br>646 / *New Trust Approach Development* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 646: *New Trust Approach Development* | 0.000 | 40.023 | 38.247 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

This project funds a program of research to develop the next generation, technology data-driven approach to microelectronics assurance, to include state-of-the-art (SOTA) microelectronics, to ensure continued access to SOTA microelectronic technologies while maintaining the required level of assurance in all environments. DoD's ability to access commercial technology for its custom, secure, and assured needs is diminishing as SOTA suppliers become fewer and more focused on serving the global commercial market. DoD's technology needs are broad, and relying on a single source supplier is not feasible. Alternative, advanced manufacturing methods, technologies, and design tools are needed to produce secure and assured SOTA parts from commercial sources and to preserve access to these advanced nodes while protecting DoD and Defense Industrial Base intellectual property (IP) from exploitation. It is also intended to dramatically improve the capabilities of core Trusted & Assured Microelectronics laboratories with regard to verification and validation of SOTA microelectronics assurance.

This program of research will develop, demonstrate, and implement quantitative and innovative design, manufacturing, imaging, tagging, and control and assessment approaches for protecting DoD's microelectronics supply chain and IP, including alternatives for trusted and assured strategic radiation-hardened electronics in advanced technology nodes for next-generation strategic systems, obfuscation and disaggregation technology development, and other assurance mitigations. It will develop, demonstrate, and implement advanced imaging technologies and forensics, Design for Assurance techniques, active hardware assurance controls, electronic component markers, and a data and analysis capability to enable auditing, provenance and traceability, and independent verification and validation of commercial and specialized DoD designs. It will also develop, demonstrate, and implement concepts for the cost-effective production of custom microelectronics in low volumes and protection of sensitive IP from exploitation.

Assurance technologies that can be applied in a broad range of trusted and commercial environments can mitigate the risk associated with sole-source suppliers and increase the Government's ability to leverage commercial capabilities. The suite of developed technologies, e.g., alternative manufacturing methods and design tools, will enable DoD to obfuscate the purpose of sensitive devices, verify their origin and function, and protect sensitive IP from exploitation even while using the global supply chain for most hardware. In cases in which the risk involved precludes that level of commercial collaboration, low-volume manufacturing technologies developed under this project would permit DoD to more cheaply produce low volumes of sensitive microelectronics in secure environments. The project would also support using a repository of vetted third-party IP and electronic data automation (EDA) tools to expedite circuit design and transition promising technologies to use.

This project initially received additional funding in FY 2019 to support Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) efforts in the following focus areas: capture and secure microelectronics R&D; new microelectronics development; radiation hardening by process (RHBP) and radiation hardening by design (RHBD); and radio frequency (RF) and optoelectronics. In FY 2019, funding for those MINSEC activities was reallocated from projects P-646 to P-647.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>646 / *New Trust Approach Development* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** New Trust Approach Development | 40.023 | 38.247 | - |
| ***Description:*** This project's activities will mature and evaluate quantifiable assurance technologies and techniques through efforts that may include the conduct of studies and Broad Agency Announcements (BAAs) and other efforts to coordinate research programs across USG R&D organizations, academia, and industry.<br><br>In addition, the core Trusted & Assured Microelectronics laboratories will initiate the conduct of identified acquisition program pilots and technology development in coordination with research programs across government R&D organizations, academia and industry.<br><br>***FY 2020 Plans:***<br>• Continuation of FY 2019 activities including the following:<br>• Reducing-to-practice technologies enabling assured (1) design, (2) access, (3) component integrity, and (4) intellectual property (IP) protection.<br>• Assured design development.<br>• Systems security analysis for assurance of microelectronics in DoD missions.<br>• Analog test chip fabrication.<br>• Advanced chip interconnection development to eliminate wire bonding and improve functional performance.<br>• Printed circuit board (PrCB) design confirmation tool development.<br>• Application-specific integrated circuit (ASIC) netlist analysis capability development.<br>• Field programmable gate array (FPGA) analyses tool development.<br>• Identification of non-invasive measurement techniques at the die/wafer level to provide increased hardware assurance.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Project Code (Pcode) 646 funds will transfer from this Pcode to the new Pcodes for "Access to State-of-the-Art (SOTA) Microelectronics - Development" to properly align funding in support of the zero-trust philosophy and reflect current enhancement priorities. Total funding between the two years will decrease from $38.247 million to $32.870 million with $32.870million transferring to Access to SOTA. | | | |
| **Accomplishments/Planned Programs Subtotals** | 40.023 | 38.247 | - |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>646 / *New Trust Approach Development* |

**D. Acquisition Strategy**

N/A

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>646 / *New Trust Approach Development* | |

**Product Development ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| New Trust Approach Development | MIPR | Various (Defense Advanced Research Projects Agency, Air Force, Army, Navy, National Security Agency) : Various | 0.000 | 40.023 | Mar 2019 | 38.247 | Mar 2020 | - | | - | | - | Continuing | Continuing | - |
| | | **Subtotal** | 0.000 | 40.023 | | 38.247 | | - | | - | | - | Continuing | Continuing | N/A |

| | Prior Years | FY 2019 | | FY 2020 | | FY 2021 Base | | FY 2021 OCO | | FY 2021 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | 0.000 | 40.023 | | 38.247 | | - | | - | | - | Continuing | Continuing | N/A |

**Remarks**

NA

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>646 / *New Trust Approach Development* |

| | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | | FY 2025 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| ***New Trust Approach Development*** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Third Party Intellectual Property (IP) and electronic data automation (EDA) tool repository development | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Application Specific Integrated Circuit (ASIC) netlist analysis capability development | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Field programmable gate array (FPGA) analyses tool development | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Microelectronics assurance and supply chain technology maturation | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Assured design demonstration and evaluation | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| U.S. Government and Industry Engagement for development of data driven quantifiable assurance tools, techniques, and risk based metrics | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Microelectronics assurance and supply chain policy and guidance development/update | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Management/Technical Support | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>646 / *New Trust Approach Development* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***New Trust Approach Development*** | | | | |
| Third Party Intellectual Property (IP) and electronic data automation (EDA) tool repository development | 1 | 2020 | 4 | 2020 |
| Application Specific Integrated Circuit (ASIC) netlist analysis capability development | 1 | 2020 | 4 | 2020 |
| Field programmable gate array (FPGA) analyses tool development | 1 | 2020 | 4 | 2020 |
| Microelectronics assurance and supply chain technology maturation | 1 | 2020 | 4 | 2020 |
| Assured design demonstration and evaluation | 1 | 2020 | 4 | 2020 |
| U.S. Government and Industry Engagement for development of data driven quantifiable assurance tools, techniques, and risk based metrics | 1 | 2020 | 4 | 2020 |
| Microelectronics assurance and supply chain policy and guidance development/update | 1 | 2020 | 4 | 2020 |
| Management/Technical Support | 1 | 2020 | 4 | 2020 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>647 / *Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) Innovation and Development* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 647: *Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) Innovation and Development* | 0.000 | 423.978 | 459.170 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

This project supports the DoD microelectronics strategy by ensuring the availability of and access to advanced, assured microelectronics that are critical for DoD and national security systems. It will support the development and delivery of tools to protect the intellectual property (IP) confidentiality and integrity across the full microelectronics life cycle for a broad range of systems and missions and will provide a path for the production of these articles.

It will allow DoD to:
1) provide multiple options for programs and the defense industrial base to rapidly modernize state-of-the-art (SOTA) microelectronic components;
2) promote access to all needed current and future semiconductor technologies, including design, fabrication, packaging, and testing, from a robust base of commercially sustainable suppliers;
3) maintain technological leadership and a secure domestic microelectronics ecosystem to create a competitive industrial base of microelectronics suppliers that can rapidly adjust to the dynamics of the industry including the initiation of modernization pilots with DoD programs and industry to prototype and demonstrate new capabilities; and
4) provide DoD's captive specialty needs suppliers and dedicated facilities with cost-effective upgrade capabilities and resources so they can deliver advanced technologies.

This project supports a broader national strategy to focus resources, policies, and incentives to enhance current and next generation defense capability by:
1) maintaining access to U.S. domestic production of SOTA technology;
2) enhancing state-of-the-practice (SOTP) foundries in the U.S. to produce more advanced technologies to better serve low-volume customers in the aerospace and defense community;
3) investing in research and development (R&D) for the next generation of microelectronics for new materials, devices, architectures, and designs in coordination with the Defense Advanced Research Projects Agency (DARPA) Electronics Resurgence Initiative (ERI);
4) promoting threat awareness, proactive protection, and supply chain security to ensure these investments continue to benefit the U.S.;
5) exploring incentives for market growth through dual-use technologies, piloting acquisition reforms, partnering with industry, and providing incentives for cooperative R&D and trade; and

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>647 / *Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) Innovation and Development* |

6) establishing innovation hub pilots with industry.

MINSEC activities are categorized into the following focus areas: access to specialized SOTA and dual use microelectronics technology, collection and analysis of data for metrics driven quantifiable assurance, maintaining and enhancing U.S capability though development, capture and secure, and transition of next generation microelectronics technology insertion; microelectronics-focused workforce development; radiation hardening by process (RHBP) and radiation hardening by design (RHBD); and radio frequency (RF) and optoelectronic (OE) microelectronics.

This project in FY 2020 funds the following focus areas: SOTA access through secure design, packaging, and enhanced foundry access; development and maturation of commercially viable quantifiable assurance technologies; capture and secure microelectronics R&D; new microelectronics development and capability insertion; RHBP and RHBD; and RF and OE microelectronics.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) | 142.978 | 459.170 | - |
| ***Description:*** This project's activities will mature and evaluate microelectronics access and assurance technologies and techniques through efforts that may include the conduct of studies and Broad Agency Announcements (BAAs) and other efforts to coordinate research programs across USG R&D organizations, academia, and industry.<br><br>***FY 2020 Plans:***<br>This project will continue FY 2019 R&D activities in each of the following technical focus areas:<br>• Develop secure, accessible and cost effective state-of-the-art (SOTA) heterogeneous integration design, assembly and test capability. Establish State-of-the-art Heterogeneous Integrated Prototype Packaging sources for SOTA Digital and SOTA radio frequency (RF) applications.<br>• Capture and secure microelectronics R&D, including support and enhanced manufacturing at state-of-the-practice (SOTP) foundries.<br>• Develop new microelectronics. Support capability insertion and public/private co-development of new commercial off the shelf (COTS) programmable devices that address USG needs during their development by industry when it is the most cost-effective to do so.<br>• Develop secure radiation hardened by process and radiation hardened by design design intellectual property (IP) in all major domestic foundries and fabrication of SOTA test articles for evaluation and qualification.<br>• Develop secure RF and optoelectronic (OE) microelectronics design IP, increased availability of advanced non-complementary metal oxide semiconductor foundry processes, improved access and access to RF and OE SOTP technology and facilities, SOTP government and commercial facilities for RF and OE devices and development of SOTA IP and test articles for next generation next generation advanced sensors and communications. | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>647 / *Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) Innovation and Development* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Establish partnerships with industry for the following activities:<br>• Support joint development of assured fifth-generation (5G) and internet of things (IoT) networks, sensors, processors, accelerators, modems, transceivers, radios, programmable logic, and end-user devices using assured design and fabrication processes;<br>• Promote assured access to commercial foundry capabilities and products using assured design and fabrication processes and standards;<br>• Jointly develop assured processes and access to domestic assured memory with co-development of processing near-memory architectures and 3D integration for artificial intelligence and vision processing applications; and<br>• Pilot a state-of-the-art foundry with new assurance standards and methods to allow processing of U.S. government and critical commercial wafers in an assured commercial flow.<br><br>This project will engage early on with potential stakeholders to identify potential transition issues and aid in transition through joint collaboration between research teams and stakeholders with a focus on evaluations of prototypes, test articles, and beta versions of tools, intellectual property (IP), techniques, methods, etc. and their use in operationally-realistic scenarios.<br><br>Commercial Partnerships: Establish partnerships with industry for the following activities:<br>• Joint development of assured fifth-generation (5G) and internet of things (IoT) networks, sensors, processors, accelerators, modems, transceivers, radios, programmable logic and end-user devices using assured design and fabrication processes;<br>• Assured access to commercial foundry capabilities and products using assured design and fabrication processes and standards;<br>• Joint development of assured processes and access to domestic assured memory with co-development of processing near-memory architectures and 3D integration for artificial intelligence and vision processing applications;<br>• Assurance pilot with SOTA foundry to adopt new assurance standards and methods to allow processing of U.S. government and critical commercial wafers in an assured commercial flow; and<br>• Establish DoD's ability to safely leverage and to protect commercial mobile wireless systems, including 5G networks.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funds transferred from this Project code (Pcode) Pcode to new Pcodes for "Access to State-of-the-Art (SOTA) Microelectronics Development", "Access to Advanced Packaging and Test Development", "Address DoD Unique Needs Especially Radiation Hardening", and "Create a Resilient and Robust Microelectronics Pipeline" to properly align funding in support of the zero-trust philosophy and reflect current priorities. Total funding will decrease between the two years from $459.170 million to $415.932 | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>647 / *Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) Innovation and Development* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| million with $281.594 million transferring to SOTA Access, $81.438 million transferring to Advanced Packaging Access,$50.500 transferring to Unique Needs, and $73.766 million transferring to Create a Resilient and Robust Microelectronics Pipeline. | | | |
| **Accomplishments/Planned Programs Subtotals** | 142.978 | 459.170 | - |

| | FY 2019 | FY 2020 |
|---|---|---|
| ***Congressional Add:*** Next Generation Microelectronics | 281.000 | - |
| ***FY 2019 Accomplishments:*** This Congressional Add funding in FY 2019 to supported the following MINSEC activities:<br><br>• Development of an advanced technology center for next-generation artificial intelligence systems.<br>• Modernization enhancements for 90 nanometer (nm) to 65nm/45nm radiation-hardened semiconductor fabrication.<br>• Provided robust access to advanced node foundry production and R&D processes and fully leverage the multiple domestic R&D facilities for DoD and national needs.<br>• Delivered multiple secure design environments into industry, academia, and government to capture intellectual property (IP) and architectures and IP sharing and re-use.<br>• Accelerated radiation-hardened processor design.<br>• Continued development and expand deployment of a secure cloud environment and secure supply chain life cycle ecosystem. | | |
| **Congressional Adds Subtotals** | 281.000 | - |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>647 / *Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) Innovation and Development* |

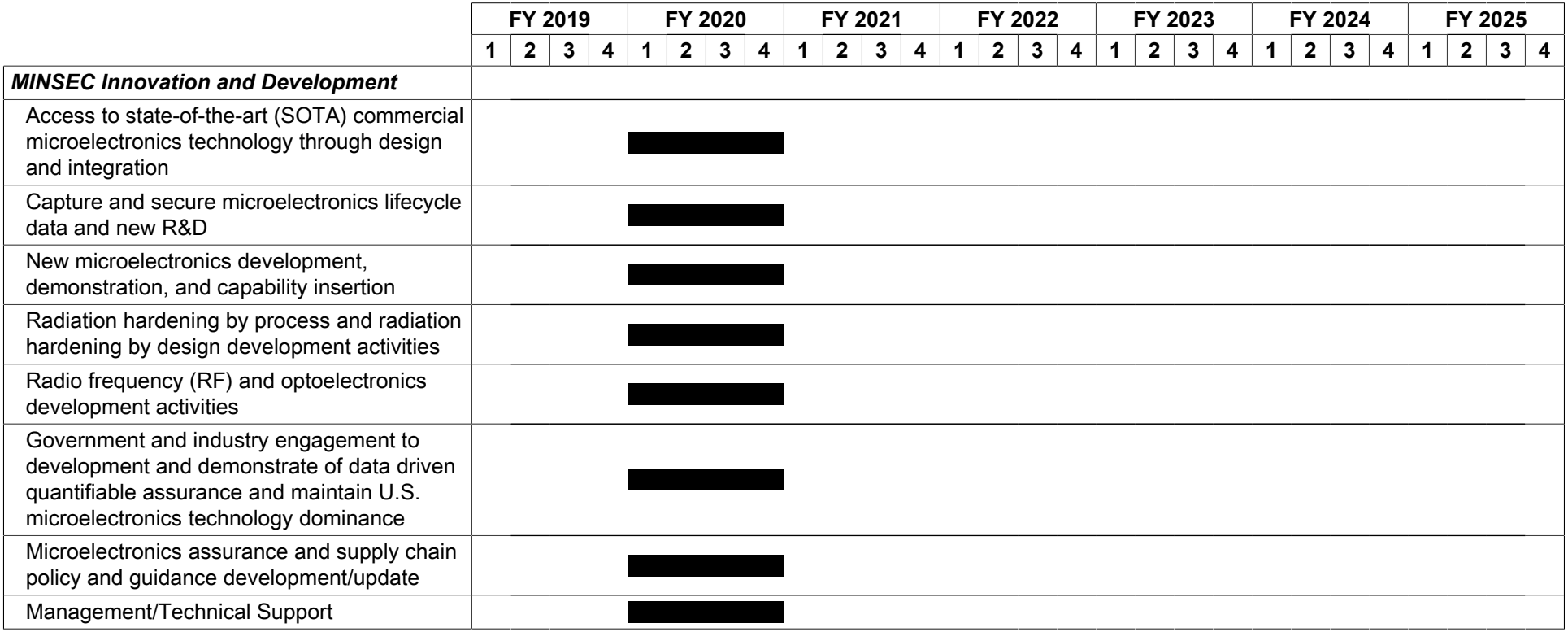
**Product Development ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) Innovation and Development | MIPR | Defense Advanced Research Projects Agency, Air Force, Army, Navy, National Security Agency : Various | - | 423.978 | Mar 2019 | 459.170 | Mar 2020 | - | | - | | - | Continuing | Continuing | - |
| | | **Subtotal** | - | 423.978 | | 459.170 | | - | | - | | - | Continuing | Continuing | N/A |

| | Prior Years | FY 2019 | | FY 2020 | | FY 2021 Base | | FY 2021 OCO | | FY 2021 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | - | 423.978 | | 459.170 | | - | | - | | - | Continuing | Continuing | N/A |

**Remarks**

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>647 / *Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) Innovation and Development* |



| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>647 / *Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) Innovation and Development* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***MINSEC Innovation and Development*** | | | | |
| Access to state-of-the-art (SOTA) commercial microelectronics technology through design and integration | 1 | 2020 | 4 | 2020 |
| Capture and secure microelectronics lifecycle data and new R&D | 1 | 2020 | 4 | 2020 |
| New microelectronics development, demonstration, and capability insertion | 1 | 2020 | 4 | 2020 |
| Radiation hardening by process and radiation hardening by design development activities | 1 | 2020 | 4 | 2020 |
| Radio frequency (RF) and optoelectronics development activities | 1 | 2020 | 4 | 2020 |
| Government and industry engagement to development and demonstrate of data driven quantifiable assurance and maintain U.S. microelectronics technology dominance | 1 | 2020 | 4 | 2020 |
| Microelectronics assurance and supply chain policy and guidance development/update | 1 | 2020 | 4 | 2020 |
| Management/Technical Support | 1 | 2020 | 4 | 2020 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 4 | R-1 Program Element (Number/Name)<br>PE 0604294D8Z / *Trusted and Assured Microelectronics* | Project (Number/Name)<br>907 / *Access to State-of-the-Art (SOTA) Microelectronics - Development* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 907: *Access to State-of-the-Art (SOTA) Microelectronics - Development* | 0.000 | 0.000 | 0.000 | 281.594 | - | 281.594 | 294.701 | 183.024 | 120.543 | 122.989 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

In 2021, this project incorporates portions of projects P291, P645 and P646. It will continue Joint Federated Assurance Center (JFAC) strategic partnerships and establish new strategic partnerships with existing commercial state-of-the-art (SOTA) domestic foundries to develop a data-driven, risk-based approach to supply chain protection and develop the assured access, secure design, and manufacture of advanced microelectronics technology and electronic components.

This project will develop a new data driven quantifiable assurance paradigm for supply chain protection. It will strengthen security while improving access, exposing no sensitive intellectual property (IP) to the foundry and requiring post-manufacture validation of foundry products. The enhancement will develop quantifiably assured design concepts in manufactured systems, enabling a formal risk-based approach to protection techniques. Manufactured microelectronics will be tested to ensure that IP protections meet or exceed current National Security Agency standards for IP protection, and to develop DoD's ability to detect certain malicious supply chain attacks on DoD microelectronics.

Successful implementation will transition these technologies to use in DoD programs, obtain access to multiple commercial microelectronics facilities, establish secure design capabilities, and solidify a data-driven approach to supply chain protection. It also includes keeping pace with the rapid advancements in microelectronics technology and the globalization of this industry sector. It will provide the basics for updating and strengthening DoD assurance policy and includes collaborating with industry to develop data driven quantifiable standards.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Joint Federated Assurance Center (JFAC) | - | - | 6.810 |
| ***Description:*** This project's activities will enhance the use of software, hardware, and firmware assurance tools, techniques, and procedures directly with programs and organizations, throughout the life cycle. JFAC provides a common forum in DoD for assurance best practices, community dialog on assurance, access to new technology and tools usable by programs throughout their life cycle for maintaining quantifiable assurance data. | | | |
| ***FY 2021 Plans:***<br>• Procure select quantities of high-priority software and hardware assurance(SwA and HwA) tools; evaluate high payoff commercial off the shelf (COTS) components to determine exploitable vulnerabilities; map vulnerabilities and threats to SwA and HwA tool capabilities to assess how well SwA and HwA tools and techniques function. | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>907 / *Access to State-of-the-Art (SOTA) Microelectronics - Development* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| • Conduct rapid acquisition pilots for enterprise procurement SwA and HwA tool enterprise license procurement models.<br>• Expand JFAC infrastructure to deploy tools & capabilities.<br>• Develop and distribute high priority acquisition workforce program and technical implementation guidance and training packages.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Transfer from Project code (Pcode) 291 in FY 2021. | | | |
| ***Title:*** Design<br>***Description:*** The enhancement will develop quantifiably assured design concepts in manufactured systems, access to advanced state-of-the-art technology through secure design centers, enabling a formal risk-based approach to protection techniques. Manufactured microelectronics will be tested to ensure that intellectual property (IP) protections meet or exceed current National Security Agency standards for IP protection, and to demonstrate DoD's ability to detect certain malicious supply chain attacks on DoD microelectronics.<br>***FY 2021 Plans:***<br>Successful implementation will transition these technologies to use in DoD programs, obtain access to multiple (2) commercial microelectronics facilities, and solidify a data-driven approach to supply chain protection.<br>Planned activities transitioning from projects P-291, P-645, P-646 and P-647 as follows:<br>• Establish vetted IP and electronic data automation (EDA) Repository, which is available for DoD use, and distribute assured tools via cloud services.<br>• Enhance secure design and cloud capability with new tools/techniques.<br>• Align stakeholders with common concerns to develop assurance enabled SOTA fabrication technologies.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Previous efforts supported in P645, P646, and P647 re-aligned to this new project code starting in FY 2021. | - | - | 42.625 |
| ***Title:*** Foundry<br>***Description:*** This activity will implement multiple foundries process design kit (PDK) environments ensuring the government is not dependent on one single source for critical components.<br>***FY 2021 Plans:***<br>Commercial foundries generate enormous amounts of data on their processes as a best practice for quality assurance to improve reliability and increase yield. It will collect and utilize this data to generate and allow quantitative comparison of performance and security metrics in the design and test stage of the microelectronics lifecycle, thereby mitigating risk. | - | - | 44.338 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>907 / *Access to State-of-the-Art (SOTA) Microelectronics - Development* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Planned activities transitioning from projects P-645, P-646 and P-647 as follows:<br>• Pilot assured access to multiple SOTA domestic fabrication sources.<br>• Continued build-out of secured design environments and persistent expertise.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Previous efforts supported in P645, P646 and P647. Realign to this new P-code starting in FY2021. | | | |
| ***Title:*** Data Driven Quantifiable Assurance Development<br><br>***Description:*** This activity includes verifying the ability to fabricate classified and/or export-controlled designs in on-shore commercial foundries– funding will establish multiple strategic partnerships with existing commercial domestic foundries to develop a data-driven, risk-based approach to supply chain protection and demonstrate the assured manufacture of advanced electronic components.<br><br>***FY 2021 Plans:***<br>The project will develop the technical means for protecting intellectual property (IP) and obfuscating the final user function from the supply chain will be realized using personalization, programmability and software, following application specific integrated circuit (ASIC) manufacturing. Efforts are on-going to update International Traffic in Arms Regulations and Export Administration Regulations policy in this area. Funding will support activities to enhance the export control regime so that it maintains or strengthens current protections while enabling access to commercial capabilities, products, and IP.<br><br>Planned activities transitioning from projects P-645, P-646 and P-647 as follows:<br>• Enhance design, physical, and functional test and verification infrastructure, tools, and capabilities in order to generate quantifiable assurance data at state-of-the-art (SOTA).<br>• Improved logical and functional nondestructive analysis for SOTA field programmable gate arrays (FPGAs), System on Chips (SoCs), and ASICs.<br>• Increased throughput and decreased data collection time for destructive physical analysis and inspection at SOTA.<br>• Acquire verification equipment to compare measured test data to design information.<br>• Scale simulation and emulation environment to compare design tool and IP artifacts to measure data.<br>• Continuation of 2020 verification and test technologies refinement activities including: (1) technical capability, through the procurement of laboratory equipment, IP, analysis tools, such as imaging software, and highly skilled tradecraft, (2) capacity to perform microelectronics assessments.<br>• Conduct game theoretic based risk assessment for fabrication and design.<br>• Instantiate authentication and protection workflows for design assurance. | - | - | 187.821 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>907 / *Access to State-of-the-Art (SOTA) Microelectronics - Development* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| • Conduct enhanced IP analysis; data driven risk assessments utilizing independent verification and validation, data captures, intelligence reports, probability of detection and false alarm rates, and game theoretics; and authentication and protection workflows.<br>• Align program to provide persistent expertise delivery for application specific risk; compare design features to enhance verification and validation.<br>• Develop a scalable classification system for design and verification ecosystem.<br>• Analyze quantitative assurance data from pilot risk assessment demonstration.<br>• In collaboration with industry standard bodies (Society of Automotive Engineers 32), promulgate new hardware assurance policy, best practices, and guidance via a navigable public library portal.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Previous efforts supported in P645, P646 and P647. Realign to this new P-code starting in FY2021. | | | |
| **Accomplishments/Planned Programs Subtotals** | - | - | 281.594 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 4 | R-1 Program Element (Number/Name)<br>PE 0604294D8Z / *Trusted and Assured Microelectronics* | Project (Number/Name)<br>907 / *Access to State-of-the-Art (SOTA) Microelectronics - Development* | |

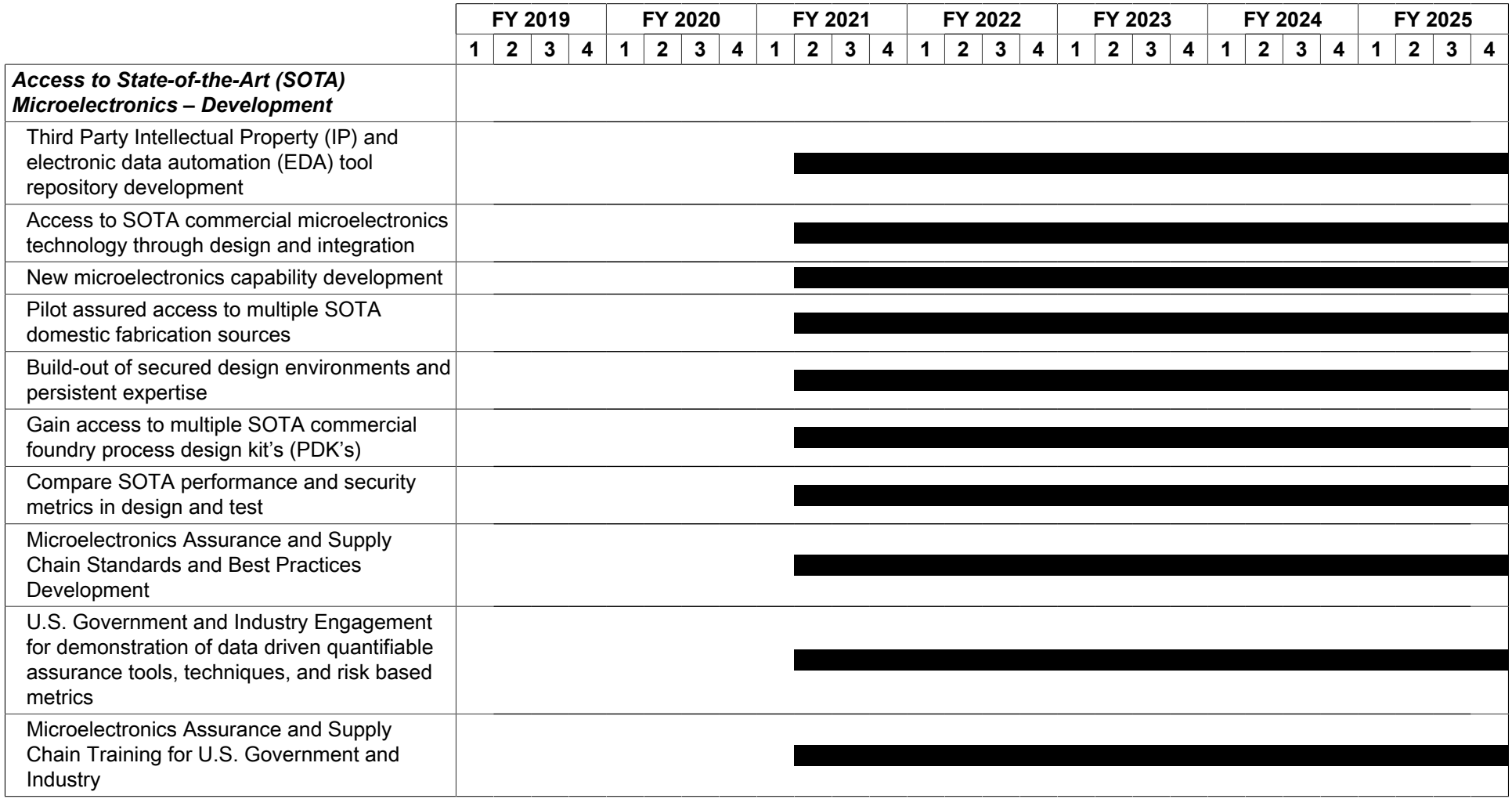
**Product Development ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Access to SOTA Microelectronics - Development | MIPR | Defense Advanced Research Projects Agency, Air Force, Army, Navy, National Security Agency : Various | - | - | | - | | 281.594 | Mar 2021 | - | | 281.594 | Continuing | Continuing | - |
| | | **Subtotal** | - | - | | - | | 281.594 | | - | | 281.594 | Continuing | Continuing | N/A |

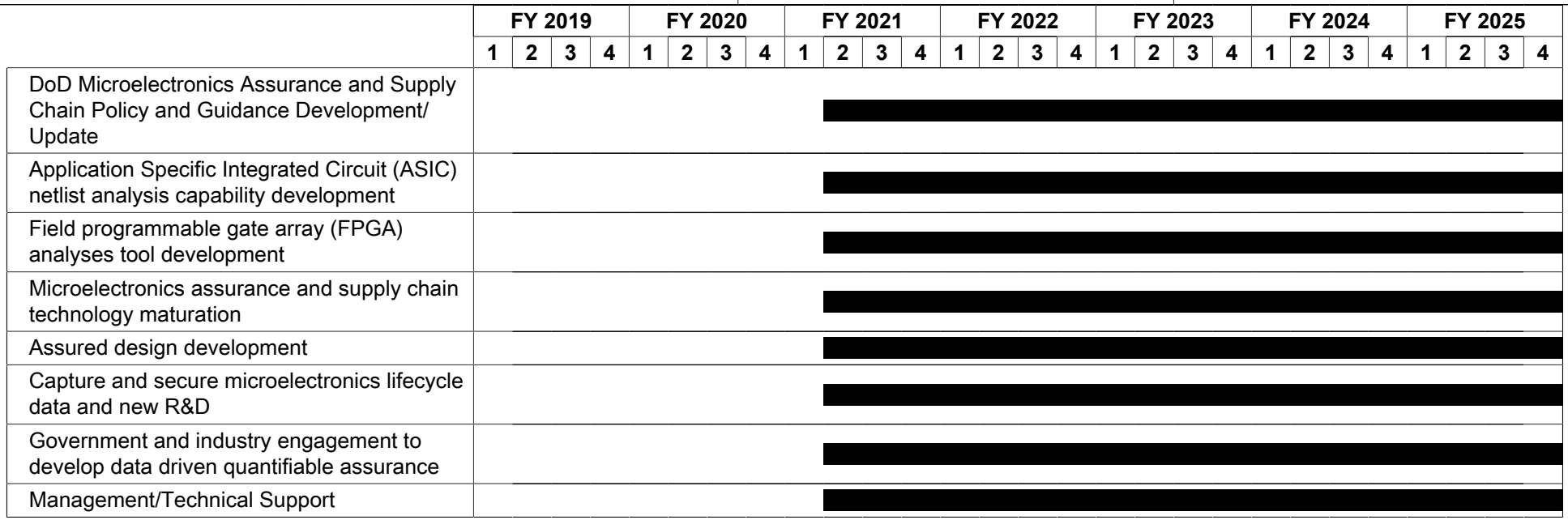
| | Prior Years | FY 2019 | | FY 2020 | | FY 2021 Base | | FY 2021 OCO | | FY 2021 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | - | - | | 0.000 | | 281.594 | | - | | 281.594 | Continuing | Continuing | N/A |

**Remarks**

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>907 / *Access to State-of-the-Art (SOTA) Microelectronics - Development* |



| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>907 / *Access to State-of-the-Art (SOTA) Microelectronics - Development* |



| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>907 / *Access to State-of-the-Art (SOTA) Microelectronics - Development* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***Access to State-of-the-Art (SOTA) Microelectronics – Development*** | | | | |
| Third Party Intellectual Property (IP) and electronic data automation (EDA) tool repository development | 2 | 2021 | 4 | 2025 |
| Access to SOTA commercial microelectronics technology through design and integration | 2 | 2021 | 4 | 2025 |
| New microelectronics capability development | 2 | 2021 | 4 | 2025 |
| Pilot assured access to multiple SOTA domestic fabrication sources | 2 | 2021 | 4 | 2025 |
| Build-out of secured design environments and persistent expertise | 2 | 2021 | 4 | 2025 |
| Gain access to multiple SOTA commercial foundry process design kit's (PDK's) | 2 | 2021 | 4 | 2025 |
| Compare SOTA performance and security metrics in design and test | 2 | 2021 | 4 | 2025 |
| Microelectronics Assurance and Supply Chain Standards and Best Practices Development | 2 | 2021 | 4 | 2025 |
| U.S. Government and Industry Engagement for demonstration of data driven quantifiable assurance tools, techniques, and risk based metrics | 2 | 2021 | 4 | 2025 |
| Microelectronics Assurance and Supply Chain Training for U.S. Government and Industry | 2 | 2021 | 4 | 2025 |
| DoD Microelectronics Assurance and Supply Chain Policy and Guidance Development/Update | 2 | 2021 | 4 | 2025 |
| Application Specific Integrated Circuit (ASIC) netlist analysis capability development | 2 | 2021 | 4 | 2025 |
| Field programmable gate array (FPGA) analyses tool development | 2 | 2021 | 4 | 2025 |
| Microelectronics assurance and supply chain technology maturation | 2 | 2021 | 4 | 2025 |
| Assured design development | 2 | 2021 | 4 | 2025 |
| Capture and secure microelectronics lifecycle data and new R&D | 2 | 2021 | 4 | 2025 |
| Government and industry engagement to develop data driven quantifiable assurance | 2 | 2021 | 4 | 2025 |

| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>907 / *Access to State-of-the-Art (SOTA) Microelectronics - Development* |

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| Management/Technical Support | 2 | 2021 | 4 | 2025 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | | | | | | | | | Date: February 2020 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 4 | | | | | R-1 Program Element (Number/Name)<br>PE 0604294D8Z / *Trusted and Assured Microelectronics* | | | | Project (Number/Name)<br>908 / *Access to Advanced Packaging and Testing - Demonstration* | | | |
| **COST ($ in Millions)** | **Prior Years** | **FY 2019** | **FY 2020** | **FY 2021 Base** | **FY 2021 OCO** | **FY 2021 Total** | **FY 2022** | **FY 2023** | **FY 2024** | **FY 2025** | **Cost To Complete** | **Total Cost** |
| 908: *Access to Advanced Packaging and Testing - Demonstration* | - | 0.000 | 0.000 | 81.438 | - | 81.438 | 98.075 | 29.702 | 0.000 | 0.000 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

This project will leverage existing commercially available expertise and capability to deliver self-sustaining digital and Radio Frequency (RF) state-of-the-art (SOTA) heterogeneous integrated packaging (SHIP), assembly, and test capability.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Access to Advanced Packaging and Testing - Development | - | - | 81.438 |
| ***Description:*** This project will utilize specialized DoD chiplets (small specialized die) in a heterogeneous integrated (HI) assembly, allowing the DoD to accelerate adoption of the most advanced microelectronics available. Working with world-class industrial partners will provide early access to proprietary information related to these technologies, giving DoD an asymmetrical advantage.<br><br>***FY 2021 Plans:***<br>This project will deliver an on-shore SHIP, assembly, and test capability. It will provide access to, personalization of, and customization for supporting DoD programs. It will enable a revolutionary leap in system performance that will greatly reduce size, weight and power (SWaP) by incorporating the immense advances in SOTA commercial off the shelf (COTS) processing technologies, such as field programmable gate arrays (FPGAs), microprocessors, and Graphic Processing Units (GPUs).<br><br>Planned activities transitioning from projects P-645, P-646 and P-647 as follows:<br>• Enhance secure design and packaging capability with new tools/techniques.<br>• Qualify advanced heterogeneous packaging technology.<br>• Continued development of secure, accessible, and cost effective SOTA heterogeneous integration design, assembly and test capability. Establish a SOTA prototype packaging secure assembly and test source for SOTA digital and RF applications.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Previous effort transferred from P645, P646, and P647, to this new project code starting in FY 2021. | | | |
| **Accomplishments/Planned Programs Subtotals** | - | - | 81.438 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>908 / *Access to Advanced Packaging and Testing - Demonstration* |

**C. Other Program Funding Summary ($ in Millions)**

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>908 / *Access to Advanced Packaging and Testing - Demonstration* | |

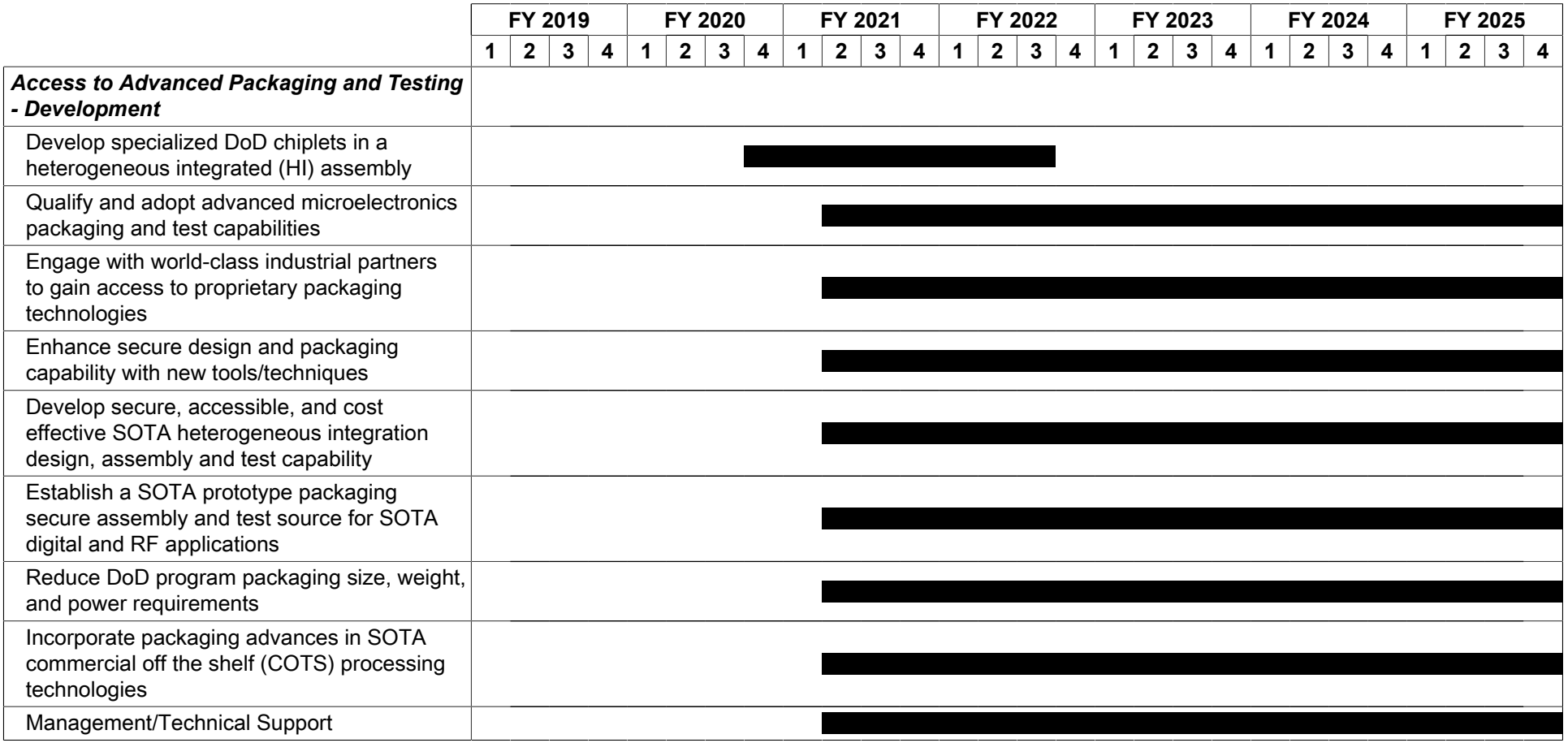
**Product Development ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Access to Advanced Packaging and Testing - Development | MIPR | Defense Advanced Research Projects Agency, Air Force, Army, Navy, National Security Agency : Various | - | - | | - | | 81.438 | Mar 2021 | - | | 81.438 | Continuing | Continuing | - |
| | | **Subtotal** | - | - | | - | | 81.438 | | - | | 81.438 | Continuing | Continuing | N/A |

| | Prior Years | FY 2019 | | FY 2020 | | FY 2021 Base | | FY 2021 OCO | | FY 2021 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | - | - | | 0.000 | | 81.438 | | - | | 81.438 | Continuing | Continuing | N/A |

**Remarks**

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>908 / *Access to Advanced Packaging and Testing - Demonstration* |



| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>908 / *Access to Advanced Packaging and Testing - Demonstration* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***Access to Advanced Packaging and Testing - Development*** | | | | |
| Develop specialized DoD chiplets in a heterogeneous integrated (HI) assembly | 4 | 2020 | 3 | 2022 |
| Qualify and adopt advanced microelectronics packaging and test capabilities | 2 | 2021 | 4 | 2025 |
| Engage with world-class industrial partners to gain access to proprietary packaging technologies | 2 | 2021 | 4 | 2025 |
| Enhance secure design and packaging capability with new tools/techniques | 2 | 2021 | 4 | 2025 |
| Develop secure, accessible, and cost effective SOTA heterogeneous integration design, assembly and test capability | 2 | 2021 | 4 | 2025 |
| Establish a SOTA prototype packaging secure assembly and test source for SOTA digital and RF applications | 2 | 2021 | 4 | 2025 |
| Reduce DoD program packaging size, weight, and power requirements | 2 | 2021 | 4 | 2025 |
| Incorporate packaging advances in SOTA commercial off the shelf (COTS) processing technologies | 2 | 2021 | 4 | 2025 |
| Management/Technical Support | 2 | 2021 | 4 | 2025 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 4 | R-1 Program Element (Number/Name)<br>PE 0604294D8Z / *Trusted and Assured Microelectronics* | Project (Number/Name)<br>911 / *Address DoD Unique Needs Especially Radiation Hardening - Development* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 911: *Address DoD Unique Needs Especially Radiation Hardening - Development* | - | 0.000 | 0.000 | 50.500 | - | 50.500 | 47.000 | 61.000 | 57.000 | 58.160 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

This project addresses the dual problems of commanding only a small market share while requiring an expansive range of unique microelectronics needs, from boutique and legacy components to state-of-the-art (SOTA) technologies. The Government must sustain specialty suppliers, given their criticality to national security. In particular, DoD needs access to a diverse microelectronics ecosystem to develop and acquire the application specific integrated circuits (ASICs) and personalized commercial off the shelf (COTS) components required for military radiation hardened and radio frequency (RF) and optoelectronic (OE) needs.

The Department frequently relies on commercial suppliers to optimize performance and reduce costs for sophisticated weapon system and secure network functionality. It is critical to have DoD reliability access to subject matter expertise, technology, and manufacturing.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Address DoD Unique Needs Especially Radiation Hardening - Development | - | - | 50.500 |
| ***Description:*** Government-unique trusted design and manufacturing flows have been developed to enable a tier of trust for select ASIC parts; however, this approach addresses only a small subset of DoD microelectronics requirements (e.g., processors, memory, microcontrollers, field programmable gate arrays (FPGAs), and radiation-tolerant processors).<br><br>***FY 2021 Plans:***<br>DoD will partner with the intelligence community, the Department of Energy, and the National Aeronautics and Space Administration to develop radiation hardened components that permit systems to operate in space and other harsh environments. state-of-the-practice (SOTP) and state-of-the-art (SOTA) technologies will be characterized and developed in support of Radiation Hardened By Process (RHBP) and Radiation Hardened By Design (RHBD) activities in support DoD modernization programs with radiation hardened requirements. A similar situation exists for radio frequency and optical applications. These two applications reflect only a small market with unique costs and specifications, which does not inherently create incentive for industrial investment.<br><br>Planned activities transitioning from projects P-645, P-646 and P-647 as follows: | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>911 / *Address DoD Unique Needs Especially Radiation Hardening - Development* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| • Establish assurance foundations for radio frequency (RF) designs.<br>• Establish foundations of assurance for RF applications; deliverables include expansion into other discipline areas: RF, optoelectronic (OE), and Additive Manufacturing.<br>• Continue to qualify sources for radiation hardened (RH) electronics to transition developed radiation hardened capabilities.<br>• Finalize qualification of additional strategic RH sources; qualify RH memories and system on chip; demonstrate up to TRL 7 of strategic Radiation Hardened By Design (RHBD) in at least 3 SOTA technology nodes; confirm additional sources for digital Radiation Hardened By Process (RHBP) capability.<br>• Deliverables: Demonstrate strategic RHBD in at least 2 SOTA technologies with validated PDKs.<br>• Major Milestone: Establish 2nd source for strategic RHBP state-of-the-practice (SOTP) partially depleted silicon on insulator source in support of nuclear modernization.<br>• Qualify new, SOTP and SOTA, sources (foundry process) for radiation hardened microelectronics.<br>• Develop and enhance DoD Lab test and evaluation infrastructure required for verification and validation of radiation hardened microelectronics, technology characterization, and device modeling and simulation.<br>• Provide coordination and subject matter expertise in support of the Strategic Radiation Hardened Electronics Council (SRHEC) for the identification of technology gaps, technology roadmap development, and inform future investments.<br>• Develop and demonstrate RF and OE microelectronics using secured design environments, advanced non-complementary metal oxide semiconductor substrates, and optimized SOTA intellectual property (IP) and test articles for next generation advanced sensors and communications.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Previous effort transferred from P645, P646, and P647, to this new project code starting in FY 2021. | | | |
| **Accomplishments/Planned Programs Subtotals** | - | - | 50.500 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 4 | R-1 Program Element (Number/Name)<br>PE 0604294D8Z / *Trusted and Assured Microelectronics* | Project (Number/Name)<br>911 / *Address DoD Unique Needs Especially Radiation Hardening - Development* | |

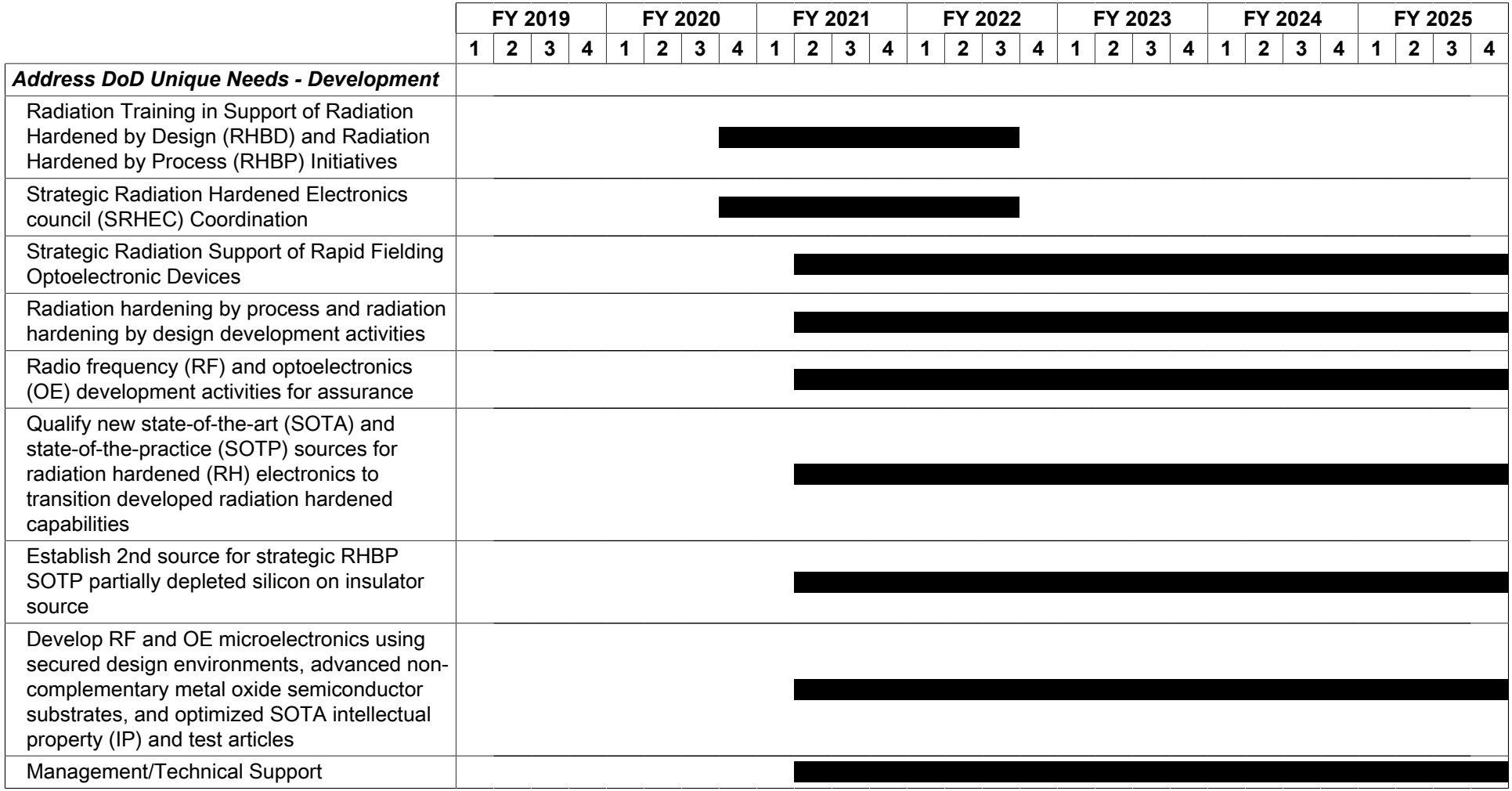
**Product Development ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Address DoD Unique Needs - Development | MIPR | Defense Advanced Research Projects Agency, Air Force, Army, Navy, National Security Agency : Various | - | - | | - | | 50.500 | Mar 2021 | - | | 50.500 | Continuing | Continuing | - |
| | | **Subtotal** | - | - | | - | | 50.500 | | - | | 50.500 | Continuing | Continuing | N/A |

| | Prior Years | FY 2019 | | FY 2020 | | FY 2021 Base | | FY 2021 OCO | | FY 2021 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | - | - | | 0.000 | | 50.500 | | - | | 50.500 | Continuing | Continuing | N/A |

**Remarks**

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>911 / *Address DoD Unique Needs Especially Radiation Hardening - Development* |



| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>911 / *Address DoD Unique Needs Especially Radiation Hardening - Development* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***Address DoD Unique Needs - Development*** | | | | |
| Radiation Training in Support of Radiation Hardened by Design (RHBD) and Radiation Hardened by Process (RHBP) Initiatives | 4 | 2020 | 3 | 2022 |
| Strategic Radiation Hardened Electronics council (SRHEC) Coordination | 4 | 2020 | 3 | 2022 |
| Strategic Radiation Support of Rapid Fielding Optoelectronic Devices | 2 | 2021 | 4 | 2025 |
| Radiation hardening by process and radiation hardening by design development activities | 2 | 2021 | 4 | 2025 |
| Radio frequency (RF) and optoelectronics (OE) development activities for assurance | 2 | 2021 | 4 | 2025 |
| Qualify new state-of-the-art (SOTA) and state-of-the-practice (SOTP) sources for radiation hardened (RH) electronics to transition developed radiation hardened capabilities | 2 | 2021 | 4 | 2025 |
| Establish 2nd source for strategic RHBP SOTP partially depleted silicon on insulator source | 2 | 2021 | 4 | 2025 |
| Develop RF and OE microelectronics using secured design environments, advanced non-complementary metal oxide semiconductor substrates, and optimized SOTA intellectual property (IP) and test articles | 2 | 2021 | 4 | 2025 |
| Management/Technical Support | 2 | 2021 | 4 | 2025 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 4 | R-1 Program Element (Number/Name)<br>PE 0604294D8Z / *Trusted and Assured Microelectronics* | Project (Number/Name)<br>912 / *Create a Resilient and Robust Microelectronics Pipeline* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 912: *Create a Resilient and Robust Microelectronics Pipeline* | 0.000 | 0.000 | 0.000 | 75.544 | - | 75.544 | 79.364 | 70.585 | 73.024 | 74.510 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

Microelectronics are critical technologies that drive the modern economy and enable the defense systems that allow warfighters to accomplish their missions. Other nations recognize the need to control the microelectronics supply chain and indigenous state-of-the-art (SOTA) manufacturing. Aggressive investments and licit and illicit actions by peer nations threaten U.S. leadership. China alone purports investment of $150 billion and a national strategy to achieve dominance in all major areas of microelectronics by 2030. Russia and China have publicly stated that advanced microelectronics, AI, and machine learning (ML) are the keys to economic and military dominance.

This project will promote microelectronics innovation and create resilient and robust Microelectronics pipeline including supplier chain, next generation technology and workforce. It will slow and in the long-term reverse offshoring trends by fostering commercial and Government alliances to preserve the U.S. ecosystem, lower barriers to innovation and adoption, strengthen workforce expertise, lead the next generation of advanced technology, and maintain the United States as the global source for high-end, secure, and reliable microelectronics components.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Create a Resilient and Robust Microelectronics Pipeline - Development | - | - | 75.544 |
| ***Description:*** DoD is investing in next-generation disruptive technology, leveraging U.S. innovation, and transitioning materials, architectures, and designs into prototype capabilities for use by multiple industrial sectors. This and additional targeted investments in workforce will begin to address long-term talent needs. In addition, the Department will continue to enhance its partnership with industry to mitigate supply chain risks. | | | |
| ***FY 2021 Plans:***<br>Significant increases in assurance and protection of DoD technical data and components will be achieved through improvements in design practices, modern commercial security practices, and advanced packaging and chain of custody technologies.<br><br>This activity, along with continued engagements and partnerships with industry will foster necessary security features in commercial products and infrastructure that will facilitate long-term assured access for the U.S. Government to commercial advanced SOTA technology providers.<br><br>Planned activities transitioning from projects P-645, P-646 and P-647 as follows: | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>912 / *Create a Resilient and Robust Microelectronics Pipeline* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| • Align stakeholder prototype demonstrators using assurance enabled SOTA fabrication.<br>• Prototype modernization of existing systems with state of the art fabrication technologies with enhanced assurance techniques.<br>• Continue established industry partnerships for assured technology co-development and prototype development. Perform modernization prototype demonstrations with DoD acquisition programs.<br>• Demonstrate limited defensive measures for the protection of commercial wireless systems;<br>• Initiate development of a tactical radio prototype, leveraging commercial and DoD-developed hardware and software;<br>• Formalize a sustainable manufacturing model for leading-edge DoD application specific integrated circuits (ASICs), following the demonstration of commercially-manufactured academic and DoD designs; [Domestic Foundries]<br>• Demonstrate rapid transition of DoD-relevant field programmable gate array-based capabilities to structured ASICs, with security capabilities to protect DoD intellectual property (IP) during manufacture;<br>• Demonstrate advanced negative capacitance non-volatile memory devices, supporting the growing energy-efficient computational needs for many DoD applications.<br>• Establish expertise, and build close connections within the U.S. Semiconductor industry to report on and mitigate supply chain threats.<br>• Development of tools to trace parts through their supply chain and track the health of the U.S. semiconductor segments.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Previous effort transferred from P645, P646, and P647, to this new project code starting in FY 2021. | | | |
| **Accomplishments/Planned Programs Subtotals** | - | - | 75.544 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>912 / *Create a Resilient and Robust Microelectronics Pipeline* |

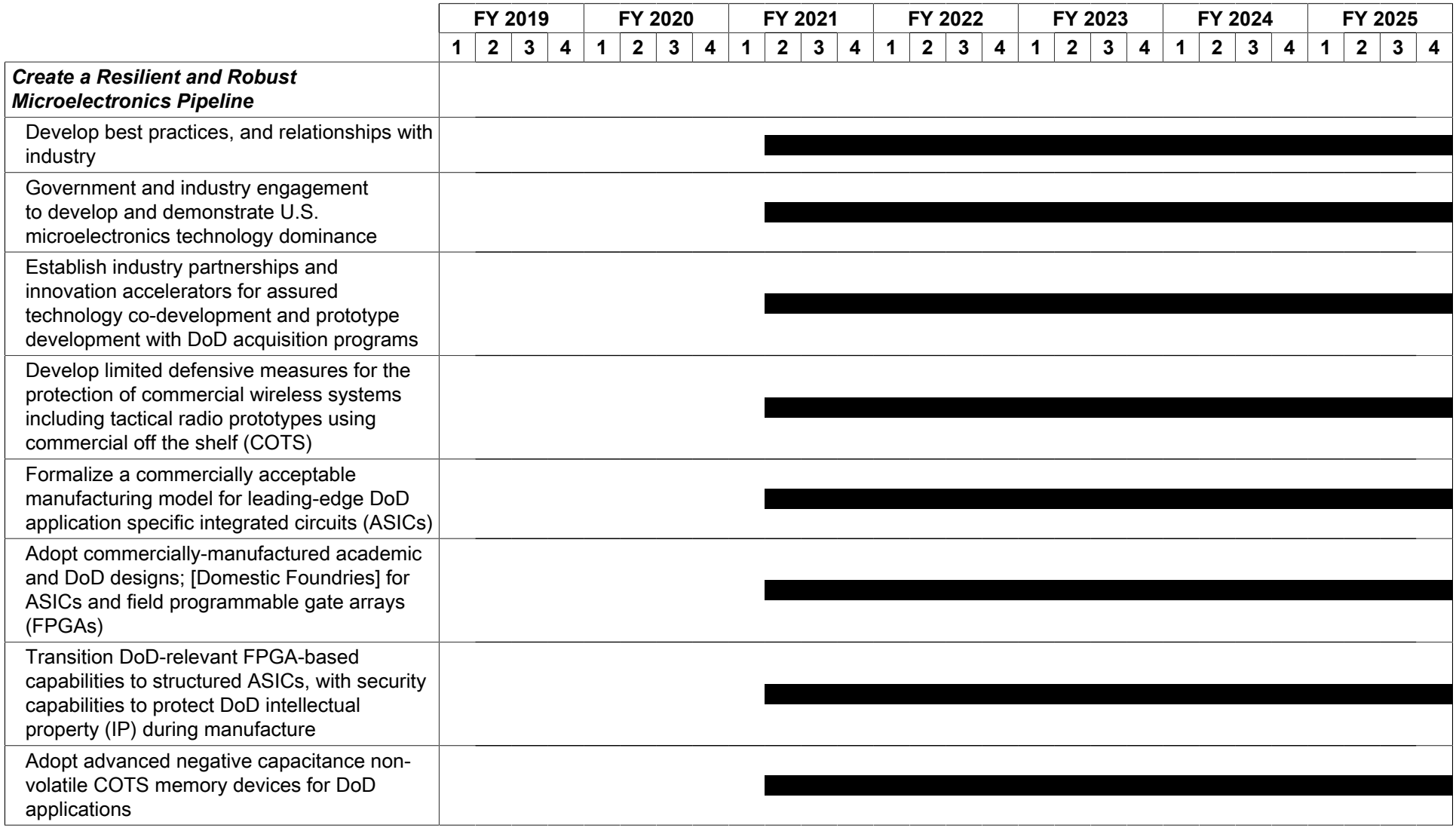
**Product Development ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Create a Resilient and Robust Microelectronics Pipeline | MIPR | Defense Advanced Research Projects Agency, Air Force, Army, Navy, National Security Agency : Various | - | - | | - | | 75.544 | Mar 2021 | - | | 75.544 | Continuing | Continuing | - |
| | | **Subtotal** | - | - | | - | | 75.544 | | - | | 75.544 | Continuing | Continuing | N/A |

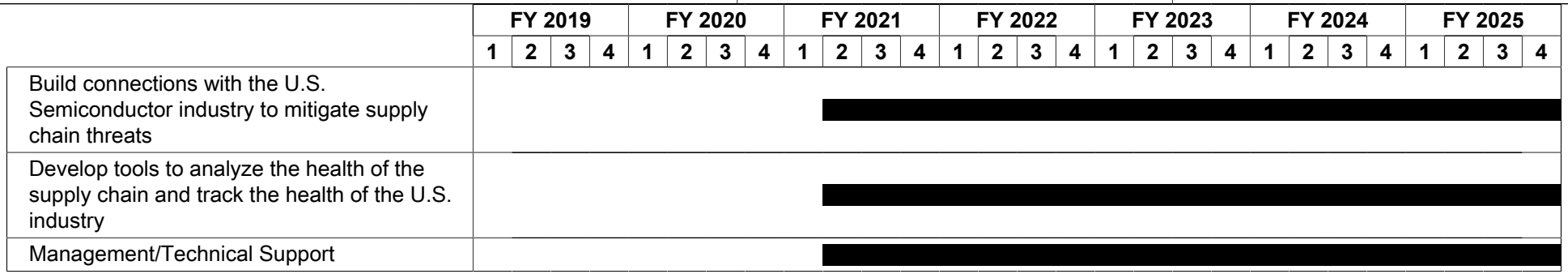
| | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | - | - | | 0.000 | | 75.544 | | - | | 75.544 | Continuing | Continuing | N/A |

**Remarks**

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>912 / *Create a Resilient and Robust Microelectronics Pipeline* |



| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>912 / *Create a Resilient and Robust Microelectronics Pipeline* |



| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>912 / *Create a Resilient and Robust Microelectronics Pipeline* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***Create a Resilient and Robust Microelectronics Pipeline*** | | | | |
| Develop best practices, and relationships with industry | 2 | 2021 | 4 | 2025 |
| Government and industry engagement to develop and demonstrate U.S. microelectronics technology dominance | 2 | 2021 | 4 | 2025 |
| Establish industry partnerships and innovation accelerators for assured technology co-development and prototype development with DoD acquisition programs | 2 | 2021 | 4 | 2025 |
| Develop limited defensive measures for the protection of commercial wireless systems including tactical radio prototypes using commercial off the shelf (COTS) | 2 | 2021 | 4 | 2025 |
| Formalize a commercially acceptable manufacturing model for leading-edge DoD application specific integrated circuits (ASICs) | 2 | 2021 | 4 | 2025 |
| Adopt commercially-manufactured academic and DoD designs; [Domestic Foundries] for ASICs and field programmable gate arrays (FPGAs) | 2 | 2021 | 4 | 2025 |
| Transition DoD-relevant FPGA-based capabilities to structured ASICs, with security capabilities to protect DoD intellectual property (IP) during manufacture | 2 | 2021 | 4 | 2025 |
| Adopt advanced negative capacitance non-volatile COTS memory devices for DoD applications | 2 | 2021 | 4 | 2025 |
| Build connections with the U.S. Semiconductor industry to mitigate supply chain threats | 2 | 2021 | 4 | 2025 |
| Develop tools to analyze the health of the supply chain and track the health of the U.S. industry | 2 | 2021 | 4 | 2025 |
| Management/Technical Support | 2 | 2021 | 4 | 2025 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 4: *Advanced Component Development & Prototypes (ACD&P)* | **R-1 Program Element (Number/Name)**<br>PE 0604331D8Z / *Rapid Prototyping Program* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 146.984 | 96.196 | 72.351 | 102.023 | - | 102.023 | 104.452 | 106.313 | 109.050 | 111.269 | Continuing | Continuing |
| 638: *Rapid Prototyping Program* | 146.984 | 96.196 | 72.351 | 102.023 | - | 102.023 | 104.452 | 106.313 | 109.050 | 111.269 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

In partnership with the Services and Defense Agencies, the Rapid Prototyping Program (RPP) encourages joint Service development through prototyping efforts that reduce risk, establish affordable and realistic requirements, and support timely development of fieldable capabilities demonstrated in an operational environment. RPP addresses priorities identified by the National Defense Strategy, the Department of Defense (DoD) modernization priorities, the Chairman's Capability Gap Assessment, and Service or Agency identified capability gaps and needs. Service and Agency senior executives participate in the project selection process to reduce duplication, synchronize prototyping efforts, and target projects with the widest benefit to the Joint Service. Overarching program goals include enhanced warfighter lethality, modernization of cross-cutting technology areas, and delivering capabilities more quickly than traditional acquisition.

RPP develops prototypes that reduce technical and integration risk to define and improve requirements for programs of record. RPP project selection aligns to DoD modernization priorities including autonomous systems; hypersonics; fully networked command, control, and communications; electronic warfare; sensors for intelligence, surveillance, and reconnaissance (ISR); and fire control. RPP rapidly develops and fields cross-cutting, prototype capabilities that demonstrate in an operational environment to inform the DoD and Service leadership. Individual projects generally receive one year of funding, typically at a cost of less than $10.000 million.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 99.107 | 100.957 | 102.964 | - | 102.964 |
| Current President's Budget | 96.196 | 72.351 | 102.023 | - | 102.023 |
| Total Adjustments | -2.911 | -28.606 | -0.941 | - | -0.941 |
| • Congressional General Reductions | - | -28.606 | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | -2.894 | - | | | |
| • Other Program Adjustments and DoD Priorities | -0.017 | - | -0.841 | - | -0.841 |
| • Economic Assumption | - | - | -0.100 | - | -0.100 |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 4: *Advanced Component Development & Prototypes (ACD&P)* | **R-1 Program Element (Number/Name)**<br>PE 0604331D8Z / *Rapid Prototyping Program* |

**Change Summary Explanation**

The Fiscal Year 2020 reduction of $28.606M is directed by Congress to reduce duplication of efforts. The Fiscal Year 2021 net reduction of $0.941M is to support other DoD priorities and economic assumptions.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 4 | R-1 Program Element (Number/Name)<br>PE 0604331D8Z / *Rapid Prototyping Program* | Project (Number/Name)<br>638 / *Rapid Prototyping Program* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 638: *Rapid Prototyping Program* | 146.984 | 96.196 | 72.351 | 102.023 | - | 102.023 | 104.452 | 106.313 | 109.050 | 111.269 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

The Rapid Prototyping Program (RPP) develops prototypes to deliver capabilities, reduce risk, and inform requirements. RPP facilitates and accelerates joint, cross-cutting prototyping efforts for the Services and Defense Agencies. This program has the agility to select, fund, and implement projects in the year of execution as new opportunities or threats emerge. Planned funding supports the National Defense Strategy, the DoD modernization priorities, and Service and Agency needs, enabling rapid response to emergent and time-sensitive threats.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** The Perfect Storm<br><br>***Description:*** This prototyping project supported the fully networked command, control, and communications capability thrust area. The Perfect Storm developed an affordable, scalable, forward deployed electronic warfare asset to support missions not currently attainable by other means due to anti-access/area denial and size, weight, and power constraints. The prototype system consists of a multi-kernel, multi-channel application specific integrated circuit, radio frequency transceiver hardware, and software development kit. Prototypes were developed and tested using a small unmanned autonomous system platform. This effort leveraged partners from the U.S. Army Communications-Electronics Research Development and Engineering Center, Intelligence and Information Warfare Directorate. Capabilities transitioned to the U.S. Army and U.S. Navy. Additional details are classified. | 5.957 | - | - |
| ***Title:*** Seeker Technology for Hypervelocity Projectiles<br><br>***Description:*** This prototyping project addressed gaps in hypersonics through the development of innovative seeker technologies suitable for hypervelocity projectiles to enhance combat lethality in complex environments. The prototype is a gun-hardened, low-cost seeker technology that significantly improves accuracy and enables critical multi-mission capability. Through this effort, multiple seeker technologies for small agile interceptors were integrated and tested using government developed and built projectiles. The prototype built on work completed in the Office of Naval Research and the Strategic Capabilities Office. Using FY 2019 funding, the project completed development and performed a final flight test prior to the technology transitioning to the U.S. Navy. | 4.400 | - | - |
| ***Title:*** High-Volume Long-Range Precision Strike<br><br>***Description:*** This effort developed and demonstrated advanced low-cost, long-range, high-volume precision strike capabilities for increased lethality that can be deployed from a variety of platforms with minimal footprint. In FY 2019, the project completed the design of the system level architecture, development and integration of components, and conducted a demonstration. The | 14.044 | - | - |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604331D8Z / *Rapid Prototyping Program* | **Project (Number/Name)**<br>638 / *Rapid Prototyping Program* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| prototype system transitioned to the U.S. Navy Medium Unmanned Surface Vessel (USV) and Large USV programs of record. Additional details are classified. | | | |
| ***Title:*** TALON HAYABUSA<br>***Description:*** This project accelerated a resilient, fully networked, command and control capability that operates outside of traditional radio frequency spectrum. It focused on improvements to automated link establishment and link recovery algorithms, and hardware updates to provide a resilient "wireless fiber" transport layer to additional platforms and missions. Using FY 2019 funding, the project upgraded the hardware and software, integrated components into a fieldable prototype, and conducted an extended field evaluation with operational users. This effort informed a U.S. Marine Corps program of record to augment wideband terrestrial radios with the new capability thereby providing access to non-traditional spectrum. Additional details are classified. | 11.819 | - | - |
| ***Title:*** Next Generation Information Awareness<br>***Description:*** This autonomy project developed and integrated standoff biometrics, technical sensors, advanced data architecture, and analytics to enable identification in near-peer, sensitive, less permissive environments. The prototype system consists of electro-optical and electro-magnetic analytic sensors, remote and autonomous sensor emplacement and control systems, automated data analytics platform, and a communications architecture. Using FY 2019 funding, the project completed the system development, sensor integration, and final demonstration. The prototype systems transitioned to a U.S. Special Operations Command program of record. Additional details are classified. | 9.999 | - | - |
| ***Title:*** Real-Time Artificial Intelligence/Machine Learning (AI/ML) on Platforms; Embedded High Performance Computing at the Edge<br>***Description:*** This project developed and demonstrated an advanced, size, weight and power constrained, embedded AI/ML computing capability for integration and demonstration on an operationally relevant platform. The prototype consists of an optimized Agile Condor pod that delivers AI/ML capabilities at the sensor thereby providing real-time information to users on the ground. Using FY 2019 funding, the project completed system development, integration, and testing of the system on an MQ-9 unmanned aerial vehicle platform with on-board sensors. This integration effort provided the system with the flight certification required for future transition efforts onto operational MQ-9 platforms. The Agile Condor systems transitioned to the U.S. Air Force. | 6.750 | - | - |
| ***Title:*** RED CYCLOPS<br>***Description:*** This project leveraged autonomy and artificial intelligence to develop and demonstrate a greatly reduced size, weight, and power imaging capability that is compatible with various platforms across the DoD. Development efforts focused on the system design, modeling, prototyping, and testing of various high-risk design aspects. Project work included design of an | 7.911 | - | - |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604331D8Z / *Rapid Prototyping Program* | **Project (Number/Name)**<br>638 / *Rapid Prototyping Program* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| advanced autonomous sensor with artificial intelligence edge processing capabilities for situation monitoring. RED CYCLOPS was integrated into a field deployable package that uses an infrared imaging sensor for observation of subjects at long stand-off distances. To accommodate this sensor, the effort implements an optical observation system design, along with a customized pod to enable integration with various ruggedized platforms. In FY 2019, the project completed the development and build efforts leading to a field test. Following the successful test, RED CYCLOPS transitioned to a program of record. Additional details are classified. | | | |
| ***Title:*** Assisted Target Recognition for Intelligence, Surveillance, and Reconnaissance<br>***Description:*** This project developed an on-board assisted target recognition capability for real-time critical threat identification and an open architecture processor for sensor cross-cueing and data collaboration. The prototype system consists of a common open architecture processor system with assisted target recognition algorithms of multiple sensor modalities (i.e., synthetic aperture radar, electro-optical/infrared, and multi-spectral imaging). Using FY 2019 funding, the project completed the software development, sensor integration, and flight demonstration. The prototype system transitioned to the U.S. Air Force Next Generation Sensors program of record. Additional details are classified. | 10.000 | - | - |
| ***Title:*** Navy/Marine Expeditionary Ship Interdiction System (NMESIS)<br>***Description:*** NMESIS developed long-term and short-term solutions for an anti-ship missile to be integrated within a High Mobility Artillery Rocket System (HIMARS) battalion to sustain a joint force military advantage. This prototype leveraged U.S. Army, U.S. Navy, and U.S. Marine Corps efforts on anti-ship capabilities. Using FY 2019 funding, NMESIS completed the development, design, build, and test of an anti-ship missile system on a remotely operated ground unit expeditionary fires vehicle. NMESIS transitioned to an existing U.S. Marine Corps HIMARS program of record. Additional details are classified. | 9.600 | - | - |
| ***Title:*** DYNAMIC<br>***Description:*** This project developed and demonstrated an enterprise-wide dynamic intelligence surveillance and reconnaissance (ISR) collection management and tasking capability to improve use of multi-intelligence ISR resources for faster target acquisition and tracking for time sensitive threats. The DYNAMIC prototype includes a sensor framework for interconnecting sensors and processing systems, analytics to assist with tasking sensors and processing data, and a user interface to visualize the sensor common operating picture and manage intelligence collection requirements. In FY 2019, the project designed and developed the multi-intelligence sensor message schema for discovery, status, and tasking; integrated sensor interface components for access to tactical sensors, processing analytics, and user interfaces for intelligence collection management; and, demonstrated the system in a live sensor test environment followed by a user assessment. The system transitioned to U.S. Army programs of record and informed the U.S. Army distributed common ground station systems and sensors for aerial intelligence program. | 9.530 | - | - |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604331D8Z / *Rapid Prototyping Program* | **Project (Number/Name)**<br>638 / *Rapid Prototyping Program* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Short Take-Off and Landing for Proliferated Intelligence, Surveillance, and Reconnaissance<br><br>***Description:*** This project addressed gaps in coverage for time sensitive target defeat missions by designing, developing, and demonstrating an operational short take-off and landing (STOL) prototype system for unmanned aerial systems (UAS). The prototype system consists of hardware that externally augments and increases launch acceleration as well as increases landing deceleration with the goal of achieving both take-off and landing in under 250 feet. The STOL capability significantly expands UAS basing options in areas that have geographic challenges. Using FY 2019 funding, the project completed system analysis, design, and fabrication of the STOL system. The project culminated with demonstrations of two different UAS platforms. The STOL system transitioned to the U.S. Special Operations Command Long Endurance Aerial Platform program of record. | 6.186 | - | - |
| ***Title:*** Autonomous Systems Focus Area<br><br>***Description:*** This focus area advances autonomous platforms in coordination with the Services and Agencies to enable more effective teaming and collaboration of autonomous systems, improve reasoning and intelligence, and build trust between humans and autonomous systems. Prototype technologies will advance capabilities such as scalable autonomous behavior, collaborative actions between autonomous systems, human-above-the-loop control, and hardware for next-generation autonomous systems. With emphasis placed on open system architectures, these prototype capabilities will reduce technical and integration risk and provide joint, cross-cutting value to the warfighter. A cross functional team, led by OUSD(R&E), will review and select prototyping proposals from across the DoD in the year of execution.<br><br>***FY 2020 Plans:***<br>RPP anticipates supporting one to two autonomy projects in FY 2020. Deliverables will include developmental and fieldable prototypes demonstrated in an operational environment with warfighter participation.<br><br>***FY 2021 Plans:***<br>RPP anticipates supporting one to two autonomy projects in FY 2021. Deliverables will include developmental and fieldable prototypes demonstrated in an operational environment with warfighter participation.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding for this focus area in FY 2021 decreases to support acceleration of other high priority prototypes efforts. | 0.000 | 12.000 | 11.450 |
| ***Title:*** Advanced Hypersonic Weapons Focus Area<br><br>***Description:*** This focus area matures key component technologies through rapid prototyping to enable advanced hypersonic weapon systems while informing concepts of operations (CONOPS). These efforts will significantly improve warfighting posture in a near-peer, regional conflict by providing the joint force with weapon systems that are high speed, highly maneuverable, and difficult to defend against. Example prototypes may include air-breathing propulsion and hypersonic guidance systems; | 0.000 | 16.000 | 45.000 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604331D8Z / *Rapid Prototyping Program* | **Project (Number/Name)**<br>638 / *Rapid Prototyping Program* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| autonomous, man-in-the-loop systems; integration of new weapons into battle management systems; and other prototypes to inform CONOPS. Specific activities include development, test, and optimization of hypersonic weapon subsystems; and, integration of weapon prototypes. These prototyping activities will enable faster transition of advanced technologies to the warfighter by reducing technical risk, informing joint force CONOPS, and demonstrating new warfighter capabilities. A cross functional team, led by OUSD(R&E), will review and select prototyping proposals from across the DoD in the year of execution.<br><br>***FY 2020 Plans:***<br>RPP anticipates supporting one to two weapons projects in FY 2020. Deliverables will include developmental and fieldable prototypes demonstrated in an operational environment with warfighter participation.<br><br>***FY 2021 Plans:***<br>RPP anticipates supporting one to two weapons projects in FY 2021. Deliverables will include developmental and fieldable prototypes demonstrated in an operational environment with warfighter participation.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Hypersonic is a DoD modernization priority and funding for this focus area increases in FY 2021 to support acceleration of new capabilities. | | | |
| ***Title:*** Fully Networked Command, Control, and Communications Focus Area<br><br>***Description:*** This focus area demonstrates joint prototypes and concepts of operation for fully networked command, control, and communications (NC3) across joint, multi-domain operations. Prototypes will help advance Service and Agency technology roadmaps by addressing high-performance, low power embedded processing and developing algorithms for automatic resource allocating, self-configuring, and self-healing networks. Prototype systems will be demonstrated in operationally relevant, contested environments to help the United States maintain its communication advantage in near-peer conflict.<br><br>***FY 2020 Plans:***<br>RPP anticipates supporting one to two fully NC3 projects in FY 2020. Deliverables will include developmental and fieldable prototypes demonstrated in an operational environment with warfighter participation.<br><br>***FY 2021 Plans:***<br>RPP anticipates supporting one to two fully NC3 projects in FY 2021. Deliverables will include developmental and fieldable prototypes demonstrated in an operational environment with warfighter participation.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding for this focus area in FY 2021 decreases to support acceleration of other high priority prototypes efforts. | 0.000 | 11.000 | 10.000 |
| ***Title:*** Electronic Warfare (EW) Technologies Focus Area | 0.000 | 11.000 | 10.573 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604331D8Z / *Rapid Prototyping Program* | **Project (Number/Name)**<br>638 / *Rapid Prototyping Program* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Description:*** This focus area develops new concepts and key technologies to improve the ability to detect, locate, and classify electronic threats; deter electronic attacks targeting military operations; defeat electronic attacks using kinetic and non-kinetic methods; and, create electromagnetic interference effects on enemy systems. Prototype technologies will advance capabilities like air and ground electronic support (ES) and electronic attack (EA), tactical EW systems, and EW mission command systems. Specific activities include development and testing of electronic protection systems, distributed and coordinated ES/EA systems, broadband radio frequency components and systems, and EW analysis support systems. These prototype capabilities will reduce technical and integration risk and provide joint, cross-cutting value to the warfighter. A cross functional team, led by OUSD(R&E), will review and select prototyping proposals from across the DoD in the year of execution.<br><br>***FY 2020 Plans:***<br>RPP anticipates supporting one Electronic Warfare projects in FY 2020. Deliverables will include developmental and fieldable prototypes demonstrated in an operational environment with warfighter participation.<br><br>***FY 2021 Plans:***<br>RPP anticipates supporting one Electronic Warfare projects in FY 2021. Deliverables will include developmental and fieldable prototypes demonstrated in an operational environment with warfighter participation.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>FY 2021 shows a marginal increase over FY 2020 and reflects increased focus within this priority area. | | | |
| ***Title:*** Sensors for Intelligence, Surveillance, and Reconnaissance (ISR) Focus Area | 0.000 | 11.000 | 10.000 |
| ***Description:*** This focus area leverages opportunities for collaboration to develop and demonstrate improved capability in long-range detecting and tracking, autonomous sensor allocation, and enhanced processing methods to ensure situation awareness is maintained in near-peer conflict. Example projects include demonstration of advanced sensors; anti-jam antenna systems; materials with novel electromagnetic properties; on-board processing; fusion of intelligence data; and, platform integration testing. These prototype capabilities will reduce technical and integration risk and provide joint, cross-cutting value to the warfighter. A cross functional team, led by OUSD(R&E), will review and select prototyping proposals from across the DoD in the year of execution.<br><br>***FY 2020 Plans:***<br>RPP anticipates supporting one to two sensors projects in FY 2020. Deliverables will include developmental and fieldable prototypes demonstrated in an operational environment with warfighter participation.<br><br>***FY 2021 Plans:*** | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604331D8Z / *Rapid Prototyping Program* | **Project (Number/Name)**<br>638 / *Rapid Prototyping Program* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| RPP anticipates supporting one to two sensors projects in FY 2021. Deliverables will include developmental and fieldable prototypes demonstrated in an operational environment with warfighter participation.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding for this focus area in FY 2021 decreases to support acceleration of other high priority prototypes efforts. | | | |
| ***Title:*** Fire Control Focus Area<br><br>***Description:*** This focus area develops and advances fire control systems to bring faster, more efficient target execution capabilities across multiple domains to the Combatant Commands. Through coordination with the Services, projects will advance subsystems to include target tracking, weapon guidance, command, and control with deliverables that include initial capability, concept of employment, and concept of operations. Prototypes developed through these efforts will transition to Service programs of record enabling the United States to maintain technological superiority. A cross functional team, led by OUSD(R&E), will review and select prototyping proposals from across the DoD in the year of execution.<br><br>***FY 2020 Plans:***<br>RPP anticipates supporting one to two Fire Control projects in FY 2020. Deliverables will include developmental and fieldable prototypes demonstrated in an operational environment with warfighter participation.<br><br>***FY 2021 Plans:***<br>RPP anticipates supporting one to two Fire Control projects in FY 2021. Deliverables will include developmental and fieldable prototypes demonstrated in an operational environment with warfighter participation.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding for this focus area in FY 2021 decreases to support acceleration of other high priority prototypes efforts. | 0.000 | 11.351 | 15.000 |
| **Accomplishments/Planned Programs Subtotals** | 96.196 | 72.351 | 102.023 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

N/A

**D. Acquisition Strategy**

RPP leverages the Services' and Defense Agencies' most efficient and effective acquisition approach for rapid prototyping. This includes using Other Transaction Authorities and new or existing contract vehicles.

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604331D8Z / *Rapid Prototyping Program* | **Project (Number/Name)**<br>638 / *Rapid Prototyping Program* |

**Product Development ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| The Perfect Storm | MIPR | U.S. Army Communications-Electronics Command (6 MIPRs) : Aberdeen Proving Ground, MD | 4.713 | 0.340 | Jun 2019 | - | | - | | - | | - | Continuing | Continuing | - |
| The Perfect Storm | MIPR | MULTI : MULTI | 3.271 | 5.617 | Sep 2019 | - | | - | | - | | - | Continuing | Continuing | - |
| Seeker Technology for Hypervelocity Projectiles | MIPR | U.S. Naval Sea Systems Command : Washington Navy Yard, D.C. | 0.500 | 4.400 | Sep 2019 | - | | - | | - | | - | Continuing | Continuing | - |
| High-Volume Long-Range Precision Strike | MIPR | NAVAL SURFACE WARFARE : DAHLGREN VA (7 MIPRS) | - | 3.843 | Sep 2019 | - | | - | | - | | - | Continuing | Continuing | - |
| High-Volume Long-Range Precision Strike | MIPR | OFFICE OF NAVAL RESEARCH : ARLINGTON, VA (4 MIPRS) | - | 1.262 | Sep 2019 | - | | - | | - | | - | Continuing | Continuing | - |
| High-Volume Long-Range Precision Strike | MIPR | Army Armaments Center : Picatinny Arsenal New Jersey | - | 8.864 | Sep 2019 | - | | - | | - | | - | Continuing | Continuing | - |
| High-Volume Long-Range Precision Strike | MIPR | Naval Information Warfare Center : San Diego, CA | - | 0.075 | Sep 2019 | - | | - | | - | | - | Continuing | Continuing | - |
| TALON HAYABUSA | MIPR | Naval Research Laboratory : Washington, DC | - | 0.616 | Sep 2019 | - | | - | | - | | - | Continuing | Continuing | - |
| TALON HAYABUSA | MIPR | Naval Surface Warfare Center (Crane) : Crane, Indiana | - | 0.702 | Sep 2019 | - | | - | | - | | - | Continuing | Continuing | - |

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604331D8Z / *Rapid Prototyping Program* | **Project (Number/Name)**<br>638 / *Rapid Prototyping Program* |

**Product Development ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TALON HAYABUSA | MIPR | Army Contracting Command : Picatinny Arsenal, New Jersey | - | 10.502 | Sep 2019 | - | | - | | - | | - | Continuing | Continuing | - |
| Next Generation Information Awareness | MIPR | US Southern Command ( 2 MIPRs) : Fort Bragg, NC | - | 9.999 | Sep 2019 | - | | - | | - | | - | Continuing | Continuing | - |
| Real-Time Artificial Intelligence/Machine Learning (AI/ML) on Platforms; Embedded High Performance Computing at the Edge | MIPR | Air Force Research Laboratory : Rome, New York | - | 6.750 | Sep 2019 | - | | - | | - | | - | Continuing | Continuing | - |
| RED CYCLOPS | MIPR | National Geospatial Agency (3 MIPRs) : Springfield, VA | - | 7.561 | Sep 2019 | - | | - | | - | | - | Continuing | Continuing | - |
| RED CYCLOPS | MIPR | Air Force Research Laboratory : Wright Patterson AFB OH | - | 0.350 | Sep 2019 | - | | - | | - | | - | Continuing | Continuing | - |
| Assisted Target Recognition for Intelligence, Surveillance, Reconnaissance | MIPR | Air Force Life Cycle Management Center (2 MIPRs) : Wright Patterson AFB OH | - | 5.830 | Sep 2019 | - | | - | | - | | - | Continuing | Continuing | - |
| Assisted Target Recognition for Intelligence, Surveillance, Reconnaissance | MIPR | MULTI : MULTI | - | 4.170 | Sep 2019 | - | | - | | - | | - | Continuing | Continuing | - |
| Navy/Marine Expeditionary Ship Interdiction System (NMESIS) | MIPR | Army Armaments Center : Picatinny Arsenal, NJ | - | 6.000 | Sep 2019 | - | | - | | - | | - | Continuing | Continuing | - |
| Navy/Marine Expeditionary Ship Interdiction System (NMESIS) | MIPR | MARCORSYSCOM : Quantico, VA | - | 3.600 | Sep 2019 | - | | - | | - | | - | Continuing | Continuing | - |
| DYNAMIC | MIPR | USA Futures Command/ | - | 9.530 | Sep 2019 | - | | - | | - | | - | Continuing | Continuing | - |

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604331D8Z / *Rapid Prototyping Program* | **Project (Number/Name)**<br>638 / *Rapid Prototyping Program* |

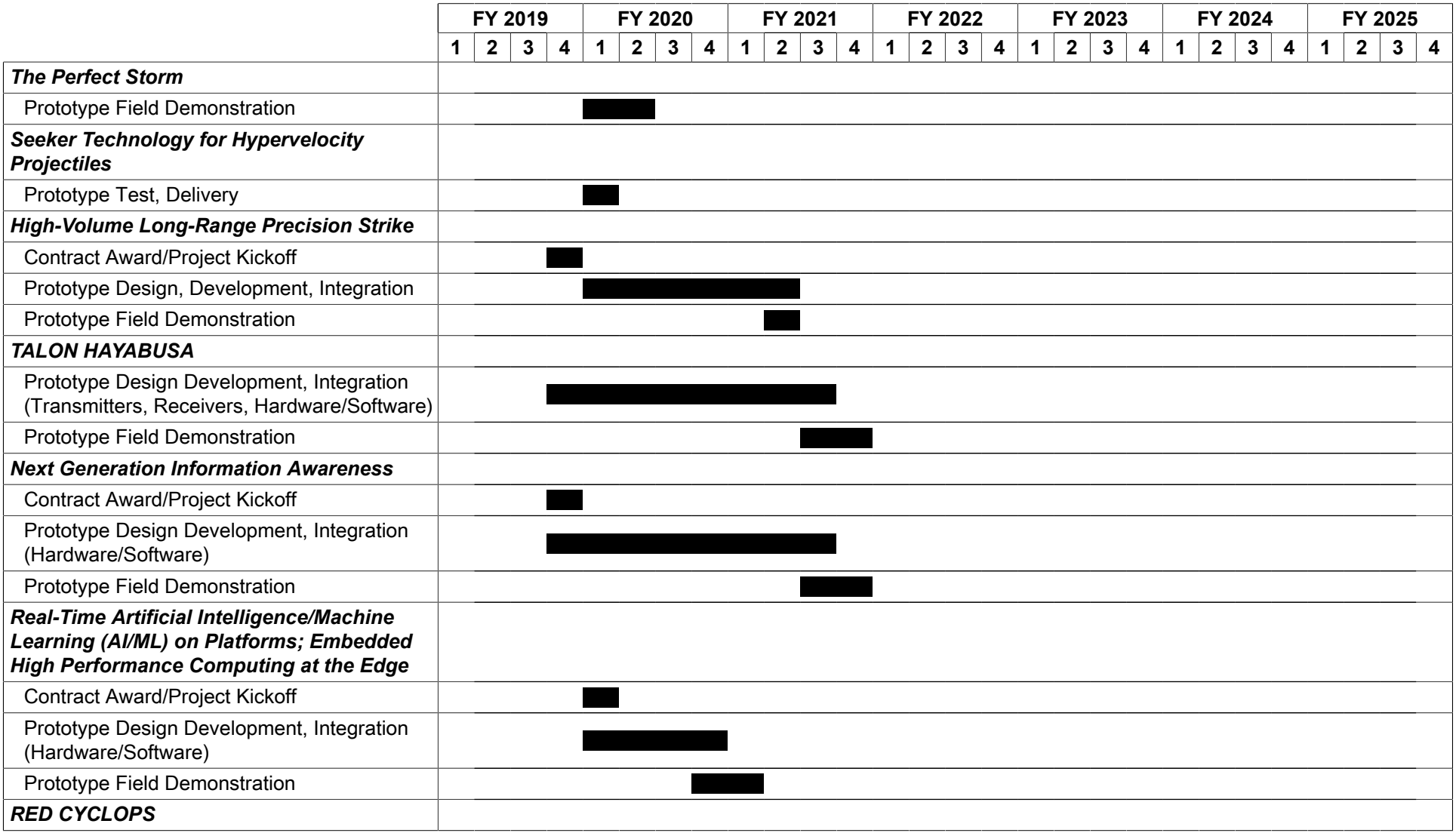
**Product Development ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Intelligence and Info Warfare : Aberdeen Proving Ground, MD | | | | | | | | | | | | | |
| Short Take-Off and Landing for Proliferated Intelligence, Surveillance, and Reconnaissance | MIPR | Air Force Research Laboratory : Kirtland AFB NM | - | 6.185 | Sep 2019 | - | | - | | - | | - | Continuing | Continuing | - |
| VARIOUS | MIPR | MULTI : MULTI | 138.500 | - | | 72.351 | Sep 2020 | 102.023 | Sep 2021 | - | | 102.023 | Continuing | Continuing | - |
| | | **Subtotal** | 146.984 | 96.196 | | 72.351 | | 102.023 | | - | | 102.023 | Continuing | Continuing | N/A |

| | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | 146.984 | 96.196 | | 72.351 | | 102.023 | | - | | 102.023 | Continuing | Continuing | N/A |

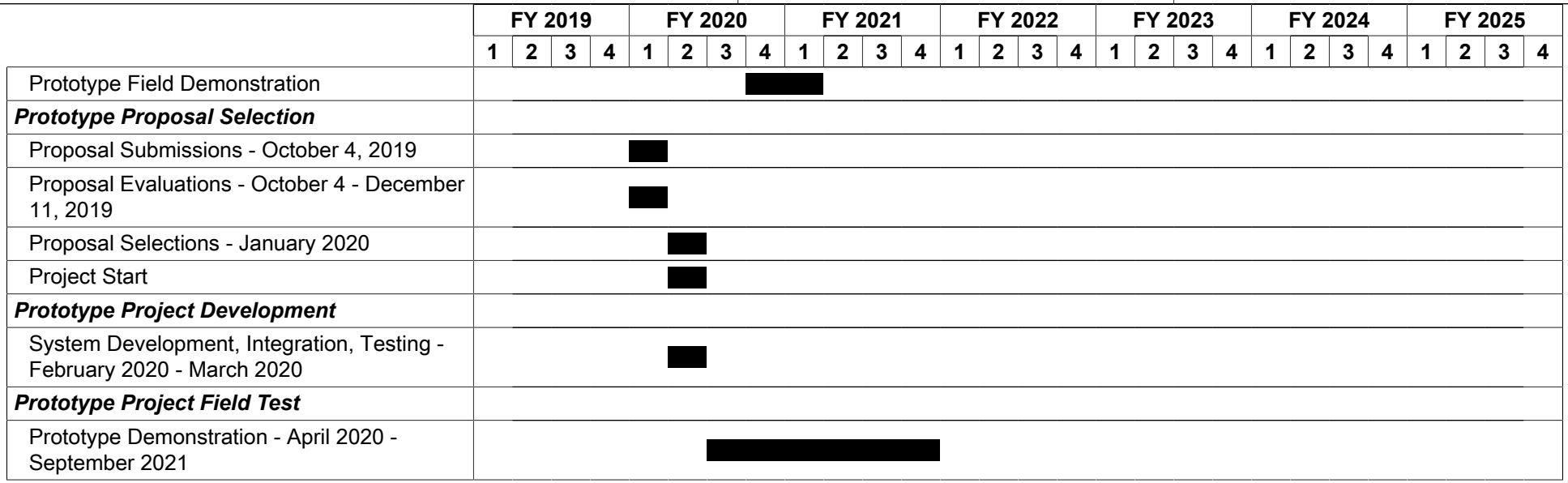
**Remarks**

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604331D8Z / *Rapid Prototyping Program* | **Project (Number/Name)**<br>638 / *Rapid Prototyping Program* |



| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604331D8Z / *Rapid Prototyping Program* | **Project (Number/Name)**<br>638 / *Rapid Prototyping Program* |

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604331D8Z / *Rapid Prototyping Program* | **Project (Number/Name)**<br>638 / *Rapid Prototyping Program* |



| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604331D8Z / *Rapid Prototyping Program* | **Project (Number/Name)**<br>638 / *Rapid Prototyping Program* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***The Perfect Storm*** | | | | |
| Prototype Field Demonstration | 1 | 2020 | 2 | 2020 |
| ***Seeker Technology for Hypervelocity Projectiles*** | | | | |
| Prototype Test, Delivery | 1 | 2020 | 1 | 2020 |
| ***High-Volume Long-Range Precision Strike*** | | | | |
| Contract Award/Project Kickoff | 4 | 2019 | 4 | 2019 |
| Prototype Design, Development, Integration | 1 | 2020 | 2 | 2021 |
| Prototype Field Demonstration | 2 | 2021 | 2 | 2021 |
| ***TALON HAYABUSA*** | | | | |
| Prototype Design Development, Integration (Transmitters, Receivers, Hardware/ Software) | 4 | 2019 | 3 | 2021 |
| Prototype Field Demonstration | 3 | 2021 | 4 | 2021 |
| ***Next Generation Information Awareness*** | | | | |
| Contract Award/Project Kickoff | 4 | 2019 | 4 | 2019 |
| Prototype Design Development, Integration (Hardware/Software) | 4 | 2019 | 3 | 2021 |
| Prototype Field Demonstration | 3 | 2021 | 4 | 2021 |
| ***Real-Time Artificial Intelligence/Machine Learning (AI/ML) on Platforms; Embedded High Performance Computing at the Edge*** | | | | |
| Contract Award/Project Kickoff | 1 | 2020 | 1 | 2020 |
| Prototype Design Development, Integration (Hardware/Software) | 1 | 2020 | 4 | 2020 |
| Prototype Field Demonstration | 4 | 2020 | 1 | 2021 |
| ***RED CYCLOPS*** | | | | |
| Contract Award/Project Kickoff | 1 | 2020 | 1 | 2020 |

| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604331D8Z / *Rapid Prototyping Program* | **Project (Number/Name)**<br>638 / *Rapid Prototyping Program* |

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| Prototype Design Development, Integration (Hardware/Software) | 1 | 2020 | 2 | 2021 |
| Prototype Field Demonstration | 3 | 2021 | 3 | 2021 |
| ***Assisted Target Recognition for Intelligence, Surveillance, Reconnaissance*** | | | | |
| Contract Award/Project Kickoff | 4 | 2019 | 1 | 2020 |
| Prototype Design Development, Integration (Hardware/Software) | 1 | 2020 | 1 | 2021 |
| Prototype Field Demonstration | 1 | 2021 | 2 | 2021 |
| ***Navy/Marine Expeditionary Ship Interdiction System (NMESIS)*** | | | | |
| Contract Award/Project Kickoff | 4 | 2019 | 4 | 2019 |
| Prototype Design Development, Integration (Hardware/Software) | 1 | 2020 | 4 | 2020 |
| Prototype Field Demonstration | 1 | 2021 | 2 | 2021 |
| ***DYNAMIC*** | | | | |
| Contract Award/Project Kickoff | 4 | 2019 | 4 | 2019 |
| Prototype Design Development, Integration (Hardware/Software) | 1 | 2020 | 3 | 2021 |
| Prototype Field Demonstration | 3 | 2021 | 4 | 2021 |
| ***Short Take-Off and Landing for Proliferated Intelligence, Surveillance, and Reconnaissance*** | | | | |
| Contract Award/Project Kickoff | 4 | 2019 | 4 | 2019 |
| Prototype Design Development, Integration (Hardware/Software) | 1 | 2020 | 4 | 2020 |
| Prototype Field Demonstration | 4 | 2020 | 1 | 2021 |
| ***Prototype Proposal Selection*** | | | | |
| Proposal Submissions - October 4, 2019 | 1 | 2020 | 1 | 2020 |
| Proposal Evaluations - October 4 - December 11, 2019 | 1 | 2020 | 1 | 2020 |
| Proposal Selections - January 2020 | 2 | 2020 | 2 | 2020 |
| Project Start | 2 | 2020 | 2 | 2020 |
| ***Prototype Project Development*** | | | | |
| System Development, Integration, Testing - February 2020 - March 2020 | 2 | 2020 | 2 | 2020 |

| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604331D8Z / *Rapid Prototyping Program* | **Project (Number/Name)**<br>638 / *Rapid Prototyping Program* |

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***Prototype Project Field Test*** | | | | |
| Prototype Demonstration - April 2020 - September 2021 | 3 | 2020 | 4 | 2021 |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 4: *Advanced Component Development & Prototypes (ACD&P)* | **R-1 Program Element (Number/Name)**<br>PE 0604341D8Z / *DIU Prototyping* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 0.000 | 0.000 | 17.000 | 13.255 | - | 13.255 | 12.867 | 12.412 | 12.761 | 13.021 | Continuing | Continuing |
| 843: *DIU Prototyping* | 0.000 | 0.000 | 17.000 | 13.255 | - | 13.255 | 12.867 | 12.412 | 12.761 | 13.021 | Continuing | Continuing |

**Note**

Defense Innovation Unit Experimental (DIUx) was established in April 2015 and DIUx 2.0 in May 2016. Defense Innovation Unit Experimental (DIUx) was transferred from OSD (PE 0602230D8Z) to Washington Headquarters Services (WHS) (PE 0603342D8W). In July 2018, DIUx was realigned from WHS to the Office of the Under Secretary of Defense, Research and Engineering (OUSD(R&E)). In August 2018, DIUx was re-designated the Defense Innovation Unit (DIU) to signify a permanence of the program. Effective FY 2020, DIU funding transferred from WHS to OSD consistent with the realignment and establishment of USD(Research & Engineering), and disestablishment of USD(Acquisition, Technology, & Logistics).

**A. Mission Description and Budget Item Justification**

The DIU mission is to accelerate innovation in the commercially-focused technology sector to the warfighter. The 2018 National Defense Strategy asserts that we have returned to an era of inter-state strategic competition with Russia and China, heightening the sense of urgency with which the nation, and Department of Defense (DoD) in particular, must reform our acquisition policies and approach to sustaining military-technical superiority. Adversaries are challenging the U.S. across several dimensions. Most importantly, adversaries are at par or ahead of the U.S. in critical technology areas. Consistent with the FY 2020 Office of Management and Budget (OMB)/Office of Science and Technology Policy (OSTP) research and development budget priorities, this new era of competition requires technological superiority to ensure ability to project power, maintain international norms and rule of law, and to serve as a credible deterrence. Notably, the critical technologies that forge military-technical superiority are increasingly dual-use and rapidly developed by the commercial sector.

The U.S. DoD relies on innovation to maintain our nation's ability to deter, and if need be, prevail in conflict. DIU increases the Department's access to leading-edge technologies and talent that reside in the commercial sector, with the ultimate goal of accelerating innovation into the hands of the warfighter. Working across the country, and in collaboration with allied international partners, DIU is developing new ways of doing business, growing our defense industrial base to include "non-traditional" companies that had previously not collaborated with the military, working with traditional vendors in novel ways to increase efficiency, and challenging innovators to share their knowledge and expertise in support of our nation's defense.

The DIU Prototyping program will find and provide access to technology companies on behalf of DoD organizations. Additionally, DIU will execute projects to leverage commercial sector technology analogous to military application thereby increasing dual-use technology agility for the DoD. DIU Prototyping funds will facilitate the award of projects that can augment commercial technologies, existing government-owned capabilities or concepts for defense application.

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 4: *Advanced Component Development & Prototypes (ACD&P)* | **R-1 Program Element (Number/Name)**<br>PE 0604341D8Z / *DIU Prototyping* |

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 0.000 | 92.000 | 13.268 | - | 13.268 |
| Current President's Budget | 0.000 | 17.000 | 13.255 | - | 13.255 |
| Total Adjustments | 0.000 | -75.000 | -0.013 | - | -0.013 |
| • Congressional General Reductions | - | -75.000 | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | - | - | | | |
| • Other Adjustments | - | - | -0.013 | - | -0.013 |

| Congressional Add Details ($ in Millions, and Includes General Reductions) | FY 2019 | FY 2020 |
|---|---|---|
| **Project:** 843: *DIU Prototyping* | | |
| Congressional Add: *N/A* | 0.000 | - |
| Congressional Add Subtotals for Project: 843 | 0.000 | - |
| Congressional Add Totals for all Projects | 0.000 | - |

**Change Summary Explanation**

This was a new Program Element in FY 2020 with two Project Codes for DIU Prototyping/Project 843, $17.000 million, and National Security Innovation Capital (NSIC)/Project 844, $75.000 million. For Project 843, FY 2020 $17.000 million was transferred from WHS O&M 0901583D8W to RDT&E, DW PE 0604341D8Z/843 DIU Prototyping. Project 844 NSIC was a new program add in FY2020, but was not funded due to a Congressional mark. NSIC was to fund the commercialization and scaling dual-use, hardware-based technologies that are critical to the military. These technology areas are currently severely underserved by the private U.S. venture capital industry and often funded by strategic and persistent capital from China. NSIC would attract private capital to leverage DoD investments in select priority projects that include batteries, drones, and quantum sensors.

The overall decrease in FY 2021 of $3.732 million was a planned program change. The DIU Prototyping focus areas will not only save funds in the future, but more importantly, grow the National Security Innovation Base (NSIB) by attracting new NSIB suppliers and improve the adoption of commercial technologies for the warfighter.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 4 | R-1 Program Element (Number/Name)<br>PE 0604341D8Z / *DIU Prototyping* | Project (Number/Name)<br>843 / *DIU Prototyping* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 843: *DIU Prototyping* | 0.000 | 0.000 | 17.000 | 13.255 | - | 13.255 | 12.867 | 12.412 | 12.761 | 13.021 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

The DIU mission is to accelerate innovation in the commercially-focused technology sector to the warfighter. Initially, DIUx was managed by the Under Secretary of Defense Acquisition, Technology and Logistics (OUSD(AT&L)) when it was established in July 2015. In May 2016, DIUx was placed under the control of the Secretary of Defense and administratively managed by WHS. In July 2018, DIUx was realigned from WHS to the OUSD(R&E). In August 2018, DIUx was re-designated the Defense Innovation Unit (DIU) to signify a permanence of the program. Effective FY 2020, DIU funding will transfer from WHS to OSD consistent with the functional realignment to OUSD(R&E).

The 2018 National Defense Strategy asserts that we have returned to an era of inter-state strategic competition with Russia and China, heightening the sense of urgency with which the nation, and DoD in particular, must reform our acquisition policies and approach to sustaining military-technical superiority. Adversaries are challenging the U.S. across several dimensions. Most importantly, adversaries are at par or ahead of the U.S. in critical technology areas. Consistent with the FY 2020 OMB/OSTP research and development budget priorities, this new era of competition requires technological superiority to ensure ability to project power, maintain international norms and rule of law, and to serve as a credible deterrence. Notably, the critical technologies that forge military-technical superiority are increasingly dual-use and rapidly developed by the commercial sector.

The DIU Prototyping program will find and provide access to technology companies on behalf of DoD organizations. Additionally, DIU will execute projects to leverage commercial sector technology analogous to military application thereby increasing dual-use technology agility for the DoD. In FY 2020, DIU Prototyping funds will facilitate the award of projects that can augment commercial technologies, existing government-owned capabilities or concepts for defense application.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Defense Innovation Unit (DIU) Prototyping | 0.000 | 17.000 | 13.255 |
| ***Description:*** In FY 2020, DIU will execute projects to leverage commercial sector technology analogous to military application thereby increasing dual-use technology agility for the DoD. DIU Prototyping funds will facilitate the award of projects that can augment commercial technologies, existing government-owned capabilities, or concepts for defense application. | | | |
| ***FY 2020 Plans:***<br>In FY 2020, DIU Prototyping funds will facilitate follow-on prototype contract awards of projects that can augment commercial technologies, existing government-owned capabilities, or concepts for defense application. | | | |
| ***FY 2021 Plans:*** | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604341D8Z / *DIU Prototyping* | **Project (Number/Name)**<br>843 / *DIU Prototyping* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| In FY 2021, DIU Prototyping funds will facilitate additional follow-on prototype contract awards of projects that can augment commercial technologies, existing government-owned capabilities, or concepts for defense application.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The FY 2021 decrease of $3.732 million is a result of planned program changes. | | | |
| **Accomplishments/Planned Programs Subtotals** | 0.000 | 17.000 | 13.255 |

| | FY 2019 | FY 2020 |
|---|---|---|
| ***Congressional Add:*** N/A<br>***FY 2019 Accomplishments:*** N/A | 0.000 | - |
| **Congressional Adds Subtotals** | 0.000 | - |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

For Project 843, FY 2020 $17.000 million was transferred from WHS O&M 0901583D8W to RDT&E, DW PE 0604341D8Z/843 DIU Prototyping.

**D. Acquisition Strategy**

N/A

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 4 | R-1 Program Element (Number/Name)<br>PE 0604341D8Z / *DIU Prototyping* | Project (Number/Name)<br>843 / *DIU Prototyping* | |

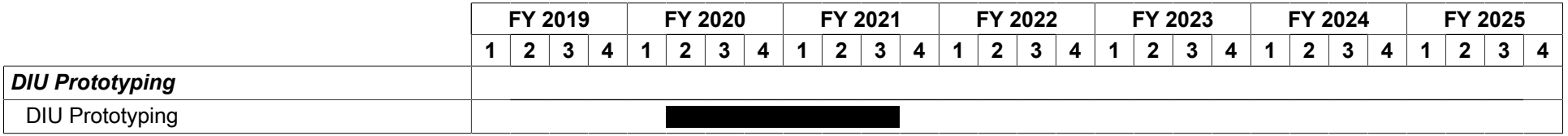
**Product Development ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DIU Prototyping | MIPR | Various : Various | - | - | | 17.000 | Jan 2020 | 13.255 | | - | | 13.255 | Continuing | Continuing | - |
| | | **Subtotal** | - | - | | 17.000 | | 13.255 | | - | | 13.255 | Continuing | Continuing | N/A |

| | Prior Years | FY 2019 | | FY 2020 | | FY 2021 Base | | FY 2021 OCO | | FY 2021 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | - | - | | 17.000 | | 13.255 | | - | | 13.255 | Continuing | Continuing | N/A |

**Remarks**

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604341D8Z / *DIU Prototyping* | **Project (Number/Name)**<br>843 / *DIU Prototyping* |



| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604341D8Z / *DIU Prototyping* | **Project (Number/Name)**<br>843 / *DIU Prototyping* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***DIU Prototyping*** | | | | |
| DIU Prototyping | 2 | 2020 | 3 | 2021 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 4: *Advanced Component Development & Prototypes (ACD&P)* | **R-1 Program Element (Number/Name)**<br>PE 0604400D8Z / *Department of Defense (DoD) Unmanned Systems Common Development* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 73.769 | 7.625 | 7.021 | 2.787 | - | 2.787 | 2.832 | 2.880 | 2.943 | 3.004 | Continuing | Continuing |
| 440: *UAS Airspace Integration* | 42.282 | 4.982 | 4.984 | 0.792 | - | 0.792 | 0.838 | 0.876 | 0.908 | 0.926 | Continuing | Continuing |
| 442: *Interoperability* | 29.672 | 2.313 | 1.788 | 1.646 | - | 1.646 | 1.745 | 1.655 | 1.679 | 1.715 | Continuing | Continuing |
| 443: *Unmanned Systems Roadmap* | 1.815 | 0.330 | 0.249 | 0.349 | - | 0.349 | 0.249 | 0.349 | 0.356 | 0.363 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

The Department of Defense (DoD) Unmanned Systems (UxS) Common Development program is a joint effort to develop and demonstrate common standards, architectures, and technologies that address unmanned systems' issues across all domains and all Military Services. The intent is to increase interoperability and effectiveness by promoting cooperative development of solutions that are applicable across all unmanned systems. This effort initially focused on addressing DoD unmanned aircraft systems (UAS), to include integration into the National Airspace System (NAS) and a common, interoperable ground station architecture and associated interface standards. While UAS initially was the primary focus, interoperability among all unmanned and manned systems is the long-term goal.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 7.763 | 3.021 | 3.074 | 0.000 | 3.074 |
| Current President's Budget | 7.625 | 7.021 | 2.787 | 0.000 | 2.787 |
| Total Adjustments | -0.138 | 4.000 | -0.287 | 0.000 | -0.287 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | 0.000 | 4.000 | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | -0.137 | - | | | |
| • A&S realignment to priority programs for Industrial Policy/Special Programs/GSA | - | - | -0.119 | - | -0.119 |
| • Cancelled Acct | -0.001 | - | - | - | - |
| • Economic Assumption | - | - | -0.003 | - | -0.003 |
| • Defense Wide Review Adjustment | - | - | -0.165 | - | -0.165 |

**Change Summary Explanation**

The FY 2021 adjustment of $0.119 million is an A&S realignment of funds in support of high priority programs in Industrial Policy/Special Programs/GSA.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 4 | R-1 Program Element (Number/Name)<br>PE 0604400D8Z / *Department of Defense (DoD) Unmanned Systems Common Development* | Project (Number/Name)<br>440 / *UAS Airspace Integration* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 440: *UAS Airspace Integration* | 42.282 | 4.982 | 4.984 | 0.792 | - | 0.792 | 0.838 | 0.876 | 0.908 | 0.926 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**Note**

Airborne Sense-and-Avoid (ABSAA) and Ground Based Sense-and-Avoid (GBSAA) technology development transitioned to UAS programs of record during FY 2013. The focus is on safe and secure integration into the National Airspace, which includes GBSAA, ABSAA, and Unmanned Traffic Management interoperability and standards.

**A. Mission Description and Budget Item Justification**

Global Hawk and Triton, as well as other Group 3-5 UAS, need a sense-and-avoid (SAA) capability as an alternate means of compliance to Title 14 Code of Federal Regulations, Part 91.111 and Part 91.113, requirement to see and avoid other aircraft. The Air Force is leading the effort to develop an ABSAA system that is suitable to support operations within U.S. and foreign airspace. The RQ-4 Global Hawk, MQ-4C Triton, MQ-1B Predator, MQ-1C Gray Eagle, and MQ-9 Reaper all have a requirement for SAA capability and will leverage the technology being developed by the Air Force. The Army is leading the development of a GBSAA system to provide a solution for improved airspace access in terminal operations as well as operations/training within the GBSAA system's coverage area (e.g., Gray Eagle at Fort Hood and Shadow operations at Cherry Point). This system provides a near-term solution and is an integral part of the long-term permanent solution. Long-term GBSAA systems and Unmanned Traffic Management (UTM) architectures, operating concepts, standards and technology are being developed to allow DoD, commercial, and private manned and Group 1-5 Unmanned Aircraft to operate safely and effectively in the national airspace. The change in airspace procedures, airspace de-confliction, and Traffic Management requires new processes and procedures for safe and secure national airspace access.

This joint funding also supports development of common operating concepts, policy, standards, modeling and simulation, and technology to enable DoD UAS to routinely access the national and international airspace systems.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Unmanned Aircraft System Airspace Integration Initiatives | 4.982 | 4.984 | 0.792 |
| ***Description:*** Starting in FY 2010, the Department's sense and avoid (SAA) developmental efforts are enhanced by this defense-wide program element. This program has provided joint funding to accelerate the development of SAA technology and standards to enable UAS to routinely access the national and international airspace systems. This program also supports development of UAS airspace integration policy and standards as well as the modeling, simulation, and operational analysis needed to validate the standards. In FY 2013, ABSAA and GBSAA efforts transitioned to the Services. | | | |
| FY 2019 Accomplishments: | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604400D8Z / *Department of Defense (DoD) Unmanned Systems Common Development* | **Project (Number/Name)**<br>440 / *UAS Airspace Integration* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Completed Final Operational Capability at Grand Forks and Bealle AFB.<br>Integrated GBSAA at Fargo and March AFB.<br>Completed full testing of UTM Architecture and DoD unmanned Service Supplier System interfaces in coordination with the Department of Homeland Security.<br>Conducted Integration of UTM into DoD Counter UAS Systems.<br>Completed study and formally requested a Remote Identification Rule to the Federal Aviation Administration (FAA).<br><br>***FY 2020 Plans:***<br>Develop future policy and architectures that support the operation of DoD, Commercial, and Private Group 1-5 UAS systems in the national Airspace safely by developing an UTM system. Investigate and draft Cyber security concept of operations for Manned and Unmanned Aircraft Systems operating in the National Airspace with a focus on Groups 1-2 UAS. Evaluate and validate identified best-candidate solutions for low size, weight, power and cost technology supporting military small UAS operations in national, international, and foreign national airspace. Develop quantitative safety assessment approaches that support unique UAS operations to support emerging DoD needs and inform future rulemaking. Make formal recommendations for separation minima that enable low-altitude military UAS to remain clear of other aircraft. Continue to engage the FAA to advance DoD UAS airspace integration. Investigate and draft Cyber security concept of operations for Manned and Unmanned Aircraft Systems operating in the national airspace.<br><br>***FY 2021 Plans:***<br>Develop policy and architectures that support the operation of DoD and interagency Group 1-5 UAS systems in the national Airspace safely by developing an UTM system and Ground Base Sense and Avoid and Air Base Sense and Avoid architecture. Investigate and draft Cyber security concept of operations for Manned and Unmanned Aircraft Systems operating in the national airspace with a focus on Groups 1-2 UAS by limiting Cyber security vulnerabilities. Evaluate and validate identified best-candidate solutions for low size, weight, power and cost technology supporting military sUAS operations in national, international and foreign national airspace with improved cyber security controls. Develop quantitative safety assessment approaches that support unmanned systems operations to support emerging DoD needs and inform rulemaking with the interagency. Provide formal recommendations for safe separation standards and techniques that enable low-altitude military UAS to remain clear of other aircraft. Continue to engage the FAA to advance DoD UAS and Counter UAS airspace integration. Investigate and draft Cyber security concept of operations for Manned and Unmanned Aircraft Systems operating in the national airspace.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The decrease in funding from FY 2020 to FY 2021 is due to the Defense Wide Review and other A&S program re-alignments. | | | |
| **Accomplishments/Planned Programs Subtotals** | 4.982 | 4.984 | 0.792 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604400D8Z / *Department of Defense (DoD) Unmanned Systems Common Development* | **Project (Number/Name)**<br>440 / *UAS Airspace Integration* |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604400D8Z / *Department of Defense (DoD) Unmanned Systems Common Development* | **Project (Number/Name)**<br>440 / *UAS Airspace Integration* |

**Product Development ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GBSAA | MIPR | USAF A3 AFLCMC/ HBAG (VOLPE/ MITRE) : AFLCMC/ HBAG | 34.012 | 0.480 | Jul 2019 | 0.160 | | 0.041 | | - | | 0.041 | Continuing | Continuing | - |
| DoD UTM | MIPR | NASA : Ames Research California | 1.135 | 3.000 | Feb 2019 | 0.387 | | 0.550 | | - | | 0.550 | Continuing | Continuing | - |
| National Guard GBSAA | MIPR | Army PM UAS : Army Redstone, Alabama | 4.843 | 1.020 | Apr 2019 | 0.000 | | - | | - | | - | Continuing | Continuing | - |
| DoD UxS adn C-UxS Architecture and Standards | MIPR | USAF/ARMY/ NAVY/NASA : Labs - California, NY, Alabama | - | - | | 4.000 | Jul 2020 | 0.000 | | 0.000 | | 0.000 | Continuing | Continuing | - |
| | | **Subtotal** | 39.990 | 4.500 | | 4.547 | | 0.591 | | 0.000 | | 0.591 | Continuing | Continuing | N/A |

**Remarks**

FY20 Congressional Add will support the development of UXS and counter UXS Architecture and development standards

**Support ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| USAF - A3 PBFA Support | Option/ LH | USAF A3 AFLCMC/ HBAG : AFLCMC/ HBAG | 2.292 | 0.482 | Mar 2019 | 0.437 | | 0.201 | | - | | 0.201 | Continuing | Continuing | - |
| | | **Subtotal** | 2.292 | 0.482 | | 0.437 | | 0.201 | | - | | 0.201 | Continuing | Continuing | N/A |

**Remarks**

NA

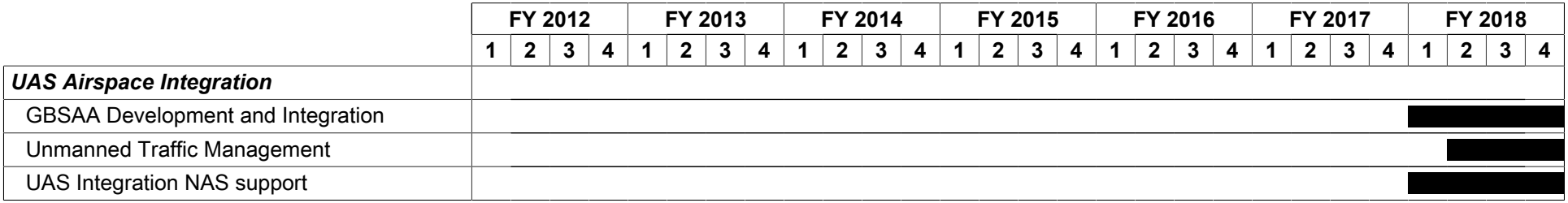
| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604400D8Z / *Department of Defense (DoD) Unmanned Systems Common Development* | **Project (Number/Name)**<br>440 / *UAS Airspace Integration* | |

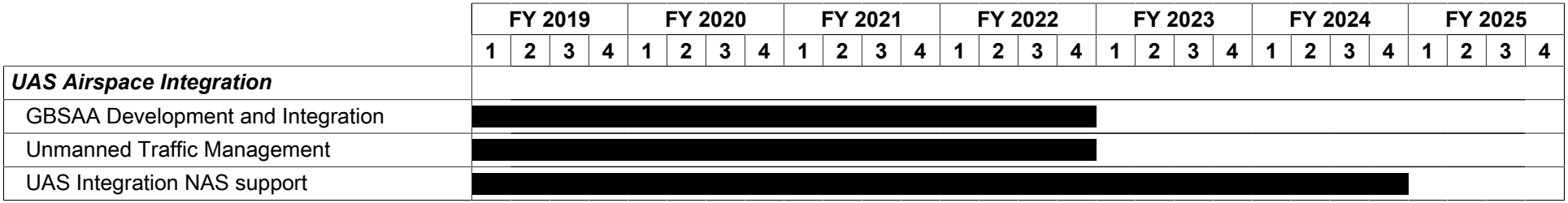
| | Prior Years | FY 2019 | | FY 2020 | | FY 2021 Base | | FY 2021 OCO | | FY 2021 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | 42.282 | 4.982 | | 4.984 | | 0.792 | | 0.000 | | 0.792 | Continuing | Continuing | N/A |

**Remarks**

NA

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604400D8Z / *Department of Defense (DoD) Unmanned Systems Common Development* | **Project (Number/Name)**<br>440 / *UAS Airspace Integration* |



| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604400D8Z / *Department of Defense (DoD) Unmanned Systems Common Development* | **Project (Number/Name)**<br>440 / *UAS Airspace Integration* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***UAS Airspace Integration*** | | | | |
| GBSAA Development and Integration | 1 | 2018 | 4 | 2022 |
| Unmanned Traffic Management | 2 | 2018 | 4 | 2022 |
| UAS Integration NAS support | 1 | 2018 | 4 | 2024 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604400D8Z / *Department of Defense (DoD) Unmanned Systems Common Development* | **Project (Number/Name)**<br>442 / *Interoperability* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 442: *Interoperability* | 29.672 | 2.313 | 1.788 | 1.646 | - | 1.646 | 1.745 | 1.655 | 1.679 | 1.715 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

The Interoperability project will develop and demonstrate an interoperable, standards-based, open architecture solution for cross-domain (air, ground, maritime) unmanned systems. The intent is to improve joint and coalition interoperability and promote competition through the implementation of open standards and open architectures.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Interoperability | 2.313 | 1.788 | 1.646 |
| ***Description:*** Develop and demonstrate an interoperable, standards-based, open ground station architecture for cross-domain (air, ground, maritime) unmanned systems; improve joint and coalition interoperability; and promote competition through the implementation of open standards and open architectures.<br><br>FY 2019 Accomplishments:<br>Completed integration of an autonomous Target recognition system with a Small UAS for tactical intelligence, surveillance, and reconnaissance (ISR) support.<br>Developed the Blue UAS architecture that is being used to support the future small UAS Program of records.<br>Developed the Unmanned System Safety Precepts and draft Guide for integration UxS into the Joint Force Structure.<br>Drafted a type 1 encryption standard for the Joint Communications Architecture for Unmanned Systems to improve long range communications.<br>Established the DoD Counter UAS Senior Integration Group Process.<br>Established a policy for improved airspace operations with the FAA to improve the High Altitude Research Project (HARP) and other critical airspace operations.<br>Developed a Counter UAS Security Classification Guide.<br>Executed policy preventing cyber security vulnerabilities.<br>Drafted a UAS traffic management concept of operations with the Department of Homeland Security (DHS) and FAA for improvement in the National Airspace.<br><br>***FY 2020 Plans:*** | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604400D8Z / *Department of Defense (DoD) Unmanned Systems Common Development* | **Project (Number/Name)**<br>442 / *Interoperability* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Support the continued development and implementation of the Service Acquisition Executive (SAE) working group for UAS Control Segment Architecture (UCS) interfaces and Joint Architecture Unmanned System (JAUS).<br>Develop a Joint Communications Architecture for Unmanned Systems (JCAUS) and demonstrate a JCAUS compliant prototype to validate and further mature the architecture.<br>Develop Safety standards and policy for Unmanned and Autonomous systems that will allow for the incorporation of Artificial Intelligence (AI).<br>Continue support for Unmanned Systems Interoperability and Integration workshop/technical exchange meeting.<br>Develop Unmanned System autonomous test and evaluation standards and architectures using modeling and simulation.<br>Investigate a Cyber secure solution for integrating Artificial Intelligent systems into Unmanned Systems.<br>Continue support to DoD Interoperability Integrated Product Team (IPT).<br>Develop a UAS Architecture for Small Unmanned Systems.<br>Validate Autonomous Safety Precepts for Unmanned Systems.<br>Improve cybersecurity and communication links of UxS. | | | |
| ***FY 2021 Plans:***<br>Develop a UAS Architecture for Small Unmanned Systems.<br>Validate Autonomous Safety Precepts for Unmanned Systems.<br>Improve cybersecurity and communication links of UxS.<br>Integrate Cyber Security Policies and Standards into UxS Architectures.<br>Develop Acquisition strategies to support federal interagency small UAS architecture.<br>Develop a Joint Communications Architecture for Unmanned systems (JCAUS) and demonstrate a JCAUS compliant prototypes to validate and further mature the architecture.<br>Develop Safety standards and policy for Unmanned and Autonomous systems that will allow for the incorporation of AI.<br>Continue support for Unmanned Systems Interoperability and Integration workshop/technical exchange meeting.<br>Develop and Unmanned system autonomous test and Evaluation standards and architectures using modeling and simulation.<br>Investigate a Cyber secure solution for integrating Artificial Intelligent systems into Unmanned Systems.<br>Maintain the Joint Robotics and Autonomous Solutions Enterprise by maintaining DoD directed Interoperability standards across the service for all robotic and autonomous systems. | | | |
| ***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The decrease in funding from FY 2020 to FY 2021 is due to the Defense Wide Review and other A&S program re-alignments. | | | |
| **Accomplishments/Planned Programs Subtotals** | 2.313 | 1.788 | 1.646 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604400D8Z / *Department of Defense (DoD) Unmanned Systems Common Development* | **Project (Number/Name)**<br>442 / *Interoperability* |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

n/a

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 4 | R-1 Program Element (Number/Name)<br>PE 0604400D8Z / *Department of Defense (DoD) Unmanned Systems Common Development* | Project (Number/Name)<br>442 / *Interoperability* | |

**Product Development ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| UxS Interoperability and Architecture Development | MIPR | Labs, Warfare Centers, and DoD components and support : DoD Labs, Warefare Center, DoD and support service | 29.672 | 2.313 | Sep 2019 | 1.788 | Apr 2020 | 1.646 | | - | | 1.646 | Continuing | Continuing | - |
| | | **Subtotal** | 29.672 | 2.313 | | 1.788 | | 1.646 | | - | | 1.646 | Continuing | Continuing | N/A |

**Remarks**

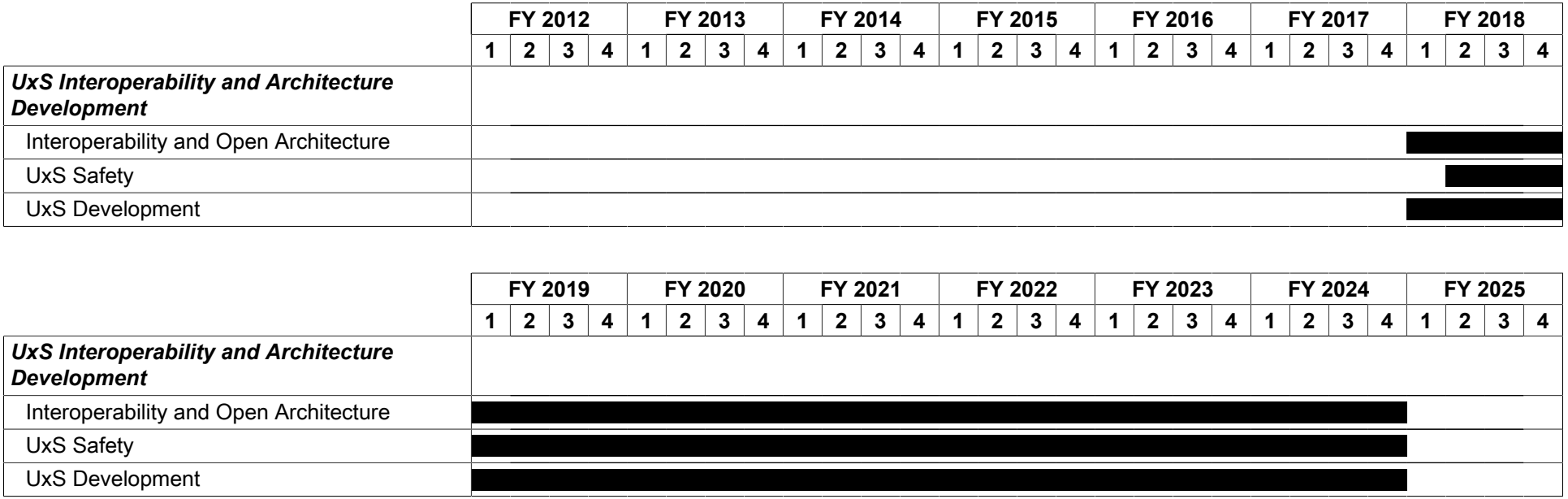
NA

| | Prior Years | FY 2019 | | FY 2020 | | FY 2021 Base | | FY 2021 OCO | | FY 2021 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | 29.672 | 2.313 | | 1.788 | | 1.646 | | - | | 1.646 | Continuing | Continuing | N/A |

**Remarks**

NA

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604400D8Z / *Department of Defense (DoD) Unmanned Systems Common Development* | **Project (Number/Name)**<br>442 / *Interoperability* |



| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604400D8Z / *Department of Defense (DoD) Unmanned Systems Common Development* | **Project (Number/Name)**<br>442 / *Interoperability* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***UxS Interoperability and Architecture Development*** | | | | |
| Interoperability and Open Architecture | 1 | 2018 | 4 | 2024 |
| UxS Safety | 2 | 2018 | 4 | 2024 |
| UxS Development | 1 | 2018 | 4 | 2024 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604400D8Z / *Department of Defense (DoD) Unmanned Systems Common Development* | **Project (Number/Name)**<br>443 / *Unmanned Systems Roadmap* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 443: *Unmanned Systems Roadmap* | 1.815 | 0.330 | 0.249 | 0.349 | - | 0.349 | 0.249 | 0.349 | 0.356 | 0.363 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

This effort supports the Department's Unmanned Systems Integrated Roadmap and updates. The roadmap provides a DoD vision for the continuing development, fielding, and employment of unmanned systems technologies; establishes the current state of unmanned systems in today's force; and outlines a strategy to address common challenges to achieve the shared vision across all unmanned domains (air, ground, and maritime).

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Unmanned Systems Roadmap | 0.330 | 0.249 | 0.349 |

***Description:*** Develops, Drafts, and Produces the Department's Unmanned Systems Integrated Roadmap. Maintains policy, standards, and interoperability of Robotic and Autonomous systems across all domains.

FY 2019 Accomplishments:
Established the Joint Robotics and Autonomous Systems Policy and Guidance Excom to further the interoperability operations.
Drafted and Staffed a completed DoD UxS Safety issuance for Robotics and Autonomous Systems.
Analyzed the FY 2017 UxS roadmap for improved integration across the services.

***FY 2020 Plans:***
Release the FY 2019 Unmanned Systems Integrated Roadmap.
Update the Department's Unmanned Systems Integrated Roadmap and perform related studies supporting the Department's vision for unmanned systems.
Integrate feedback, responses, and new technology into the FY 2019 Roadmap.
Investigate changes to concept of operations with guidance provided by Department's vision for unmanned systems.

***FY 2021 Plans:***
Release the FY 2020 Unmanned Systems Integrated Roadmap and establish the Joint Robotics and Autonomous Systems standards, policies, and interoperability requirements.
Update the Department's Unmanned Systems Integrated Roadmap and perform related studies supporting the Department's vision for unmanned systems.
Integrate feedback, responses, and new technology into the FY 2020 Roadmap.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604400D8Z / *Department of Defense (DoD) Unmanned Systems Common Development* | **Project (Number/Name)**<br>443 / *Unmanned Systems Roadmap* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Investigate changes to concept of operations with guidance provided by Department's vision for unmanned systems.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The increase in funding between FY 2020 and FY 2021 is in support of the Unmanned Systems roadmap is developed and published every other year to provide the Department's vision for Unmanned Systems based on the rapid change in technology. | | | |
| **Accomplishments/Planned Programs Subtotals** | 0.330 | 0.249 | 0.349 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 4 | R-1 Program Element (Number/Name)<br>PE 0604400D8Z / *Department of Defense (DoD) Unmanned Systems Common Development* | Project (Number/Name)<br>443 / *Unmanned Systems Roadmap* | |

**Support ($ in Millions)**

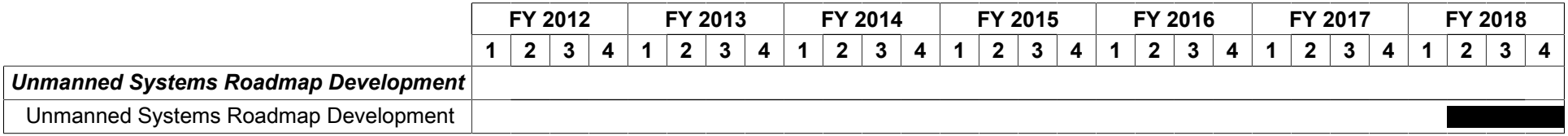
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Unmanned Systems Roadmap | C/LH | Army TARDEC Unmanned System Support services : Army TARDEC | 1.815 | 0.330 | Aug 2019 | 0.249 | | 0.349 | | - | | 0.349 | Continuing | Continuing | - |
| | | **Subtotal** | 1.815 | 0.330 | | 0.249 | | 0.349 | | - | | 0.349 | Continuing | Continuing | N/A |

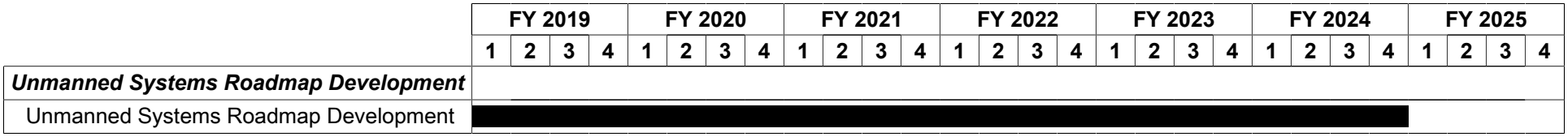
| | Prior Years | FY 2019 | | FY 2020 | | FY 2021 Base | | FY 2021 OCO | | FY 2021 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | 1.815 | 0.330 | | 0.249 | | 0.349 | | - | | 0.349 | Continuing | Continuing | N/A |

**Remarks**

NA

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604400D8Z / *Department of Defense (DoD) Unmanned Systems Common Development* | **Project (Number/Name)**<br>443 / *Unmanned Systems Roadmap* |



| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604400D8Z / *Department of Defense (DoD) Unmanned Systems Common Development* | **Project (Number/Name)**<br>443 / *Unmanned Systems Roadmap* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***Unmanned Systems Roadmap Development*** | | | | |
| Unmanned Systems Roadmap Development | 2 | 2018 | 4 | 2024 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 4: *Advanced Component Development & Prototypes (ACD&P)* | **R-1 Program Element (Number/Name)**<br>PE 0604532D8Z / *Joint Artificial Intelligence* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 70.000 | 12.968 | 0.000 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| 006: *Joint Artificial Intelligence* | 70.000 | 12.968 | 0.000 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

The JAIC was established to preserve and expand our military advantage in support of the Department's 2018 National Defense Strategy. As a primarily executing body it will accelerate the delivery of Artificial Intelligence (AI) enabled capabilities, scale the Department-wide impact of AI, and synchronize DoD AI activities to expand Joint Force advantages. The JAIC mission is to accelerate the delivery of AI to achieve impact scaled across the DoD at relevant speed to transform the DoD and ensure the nation maintains a competitive advantage. JAIC capitalizes on Project Maven's efforts as the pathfinder AI initiative for the DoD to further critical AI architecture and prototyping to rapidly expand AI to other mission areas. As JAIC efforts prove relevant, they will expedite technology transition from the laboratory to operational use, and increase Joint Force capability. Most military data storage, utilization, and analytic tools and systems were designed pre-AI and require specialized integration to enable the insertion of algorithms into their software baseline. The JAIC will adopt or adapt commercial and government developed capabilities to improve warfighting and business processes.

JAIC will execute an initial sequence of AI implementations, called National Mission Initiatives (NMI), to demonstrate value and create momentum. NMIs are high-priority, pressing operational or business reform challenges. Additionally, JAIC will work closely with individual components to help identify, shape, and accelerate component-specific AI deployments, called Component Mission Initiatives (CMI). Both NMI and CMI efforts will include government, commercial, and academic partners to prototype and develop standardized processes with respect to data, testing and evaluation, and cybersecurity. JAIC will use lessons learned from these initial projects to establish new processes and standards that will be repeatable across additional projects and immediately relevant to the Joint Force. This will be done in collaboration with partners across technology companies, consulting firms, academia, government labs, Federally Funded Research and Development Centers (FFRDC), services, and international partners.

JAIC will scale use cases throughout the DoD in a manner that aligns with and leverages DoD enterprise cloud computing. It will establish a common foundation for scaling AI's impact across DoD, including shared data, reusable tools, frameworks and standards, and cloud and edge services. This will drive greater value by enabling consistency of approach, technology, and tools for all delivery-focused AI projects.
JAIC will foster shared lessons, and establish an enterprise approach while catalyzing efforts across DoD to enable more rapid and efficient prototyping and delivery of AI capabilities. JAIC will develop a governance framework and standards for AI development and delivery and collaborate within DoD, across government, and with industry, academia, and U.S. allies to strengthen partnerships, highlight critical needs, solve problems of urgent operational significance, and adapt AI technologies for DoD missions.

JAIC develops, tests, prototypes and demonstrates innovative AI, Machine Learning (ML), data infrastructure, and model/algorithm test and assessment capabilities to integrate AI capabilities across numerous domains and technical areas including maintenance and supply chain, personnel recovery, infrastructure assessment,

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 4: *Advanced Component Development & Prototypes (ACD&P)* | **R-1 Program Element (Number/Name)**<br>PE 0604532D8Z / *Joint Artificial Intelligence* |

geospatial monitoring during disaster, and cyber sense making. JAIC develops and evaluates integrated prototype technologies in realistic operating environments with DoD entities to assess the performance or cost reduction potential of applying such advanced technology to scale across multiple services. JAIC does this by aligning rapid prototype projects under NMIs and leverages existing commercial technology for DoD use, built upon a common architecture that enables the DoD to rapidly scale AI capability.

For the Predictive Maintenance NMI, JAIC uses artificial intelligence, deep learning, and predictive analytics to forecast major issues on the H-60 helicopter platform to better enable services to respond to upcoming failure. AI/ML will help identify component failure relationships to principle end items to predict critical failure prior to corrective maintenance and reactive supply chain requisitions. This will increase efficiency, decrease fleet operating and sustainment costs for equipment platforms, and reduce the time and costs associated with repair part requisition, management and transportation. Predictive maintenance will increase fleet operational readiness through reduced deadline or degradation time, particularly by preventing critical failure during missions, thereby providing certainty for availability and tasking to combatant commands and Joint Forces. This NMI will also apply AI and ML to optimize positioning of tools, parts, and personnel to provide the Joint Force with the best location to provide efficient and cost-effective repair and supply depots.

For the Humanitarian Aid and Disaster Relief NMI, JAIC will use computer vision algorithms to detect, classify, and identify distressed or missing personnel, predict forest fire patterns and burn rates, and flooding that impact human life and infrastructure. JAIC does this within FMV images (e.g., person, forest fire lines, flood lines, terrain and infrastructure changes) and other AI algorithms for text based projects to coordinate disaster relief efforts. JAIC algorithms increase the intelligence value of ISR, reduce the human burden of screening so analysts can multi-task increasing productivity, and seeds the generation of insight from multiple intelligence sources. This program is funded under Budget Activity 4, Demonstration and Validation.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 12.970 | 0.000 | 0.000 | - | 0.000 |
| Current President's Budget | 12.968 | 0.000 | 0.000 | - | 0.000 |
| Total Adjustments | -0.002 | 0.000 | 0.000 | - | 0.000 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | - | - | | | |
| • Financing Cancelled Account | -0.002 | - | - | - | - |

| Congressional Add Details ($ in Millions, and Includes General Reductions) | FY 2019 | FY 2020 |
|---|---|---|
| **Project:** 006: *Joint Artificial Intelligence* | | |
| Congressional Add: *Joint Artificial Intelligence Center* | 12.968 | - |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 4: *Advanced Component Development & Prototypes (ACD&P)* | **R-1 Program Element (Number/Name)**<br>PE 0604532D8Z / *Joint Artificial Intelligence* |

| Congressional Add Details ($ in Millions, and Includes General Reductions) | FY 2019 | FY 2020 |
|---|---|---|
| Congressional Add Subtotals for Project: 006 | 12.968 | - |
| Congressional Add Totals for all Projects | 12.968 | - |

**Change Summary Explanation**

FY19: Reprogramming FY19 Financing Cancelled Account Reduction -0.002 million.
FY2020: Funding moves to DISA.

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 |
|---|---|---|
| ***Congressional Add:*** Joint Artificial Intelligence Center | 12.968 | - |

***FY 2019 Accomplishments:*** JAIC used rapid prototype sprints to field increasing predictive maintenance capability for the H-60 helicopter fleet across the Joint Force. JAIC used data aggregation, artificial intelligence, deep learning, and predictive analytics algorithms to detect, correlate, and predict component failure and optimize supply chain solutions. This initiative brought artificial intelligence, deep learning, and predictive algorithms into the maintenance and supply business processes of H-60 fleet management, utilizing Joint Force readiness and supply data to process at machine speed versus human speed.

JAIC also used rapid prototype sprints to field capability to the Joint Force that enabled better response to natural disasters, particularly those caused by wildfires and flooding, both common worldwide. Computer vision and algorithms not only reduce the human burden and provide efficient and effective exploration of data, but provide insights and capability that humans alone currently do not have the capacity to manage. JAIC developed algorithms focused on ISR and geospatial data to develop baseline GEOINT and infrastructure, then analyzed changes to that baseline to best provide humanitarian aid and disaster relief. This aided in the more efficient, effective, and quick recovery of distressed humans, identified damage to infrastructure, and assisted relief efforts or evacuation and aid response. Overall, this effort reduced risk to human life, critical infrastructure, and improved U.S. response in times of regional or global crises. This effort integrated AI and ML to provide actionable intelligence and enhance military decision-making by providing algorithms for predictive algorithms, computer vision to identify critical information requirements, and user alerts.

The JAIC created a Joint Common Foundation (JCF) platform that was crucial to the development, testing, and fielding of AI capabilities to the Department. This JCF contained shared common components providing NMIs/ CMIs and the Department with the packages, frameworks, software, tools necessary to accelerate the adoption

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 4: *Advanced Component Development & Prototypes (ACD&P)* | **R-1 Program Element (Number/Name)**<br>PE 0604532D8Z *I Joint Artificial Intelligence* |

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 |
|---|---|---|
| of AI-enabled capabilities. This included the build out of AI platforms in a secure protected enclave hosted in a multi-cloud/multi-domain environment which provides NMIs/CMIs with compute, storage and security.<br>The JCF platform supported scalable delivery of novel, impactful AI capability across DoD through the use of several key infrastructure elements. This infrastructure/environment supported each stage of the applied AI lifecycle, including: prototyping, integration, scaling, and support. The common foundation includes shared data, reusable tools, frameworks and standards, in addition to cloud and edge services. As the JAIC scaled and the common foundation developed, entities across DOD were be able to both use and contribute to the infrastructure, leveraging the “factory” of artifacts. This was done in collaboration with industry and government partners, including technology companies, consulting firms, academia, government labs, and Federally Funded Research and Development Centers (FFRDC), and across the Department.<br><br>The JCF platform promoted information sharing and integration with Programs of Record by facilitating rapid deployment of AI capabilities into operational environments, military platforms and IT systems. JAIC established its Tier 2 (Mission/Business Processes) and Tier 3 (IS and PIT Systems) RMF governance structure to comply with DoDI 8510.01, Risk Management Framework (RMF) for DoD Information Technology (IT) and DoDI 8500.01, Cybersecurity. | | |
| **Congressional Adds Subtotals** | 12.968 | - |

**D. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**E. Acquisition Strategy**

N/A

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 4 | R-1 Program Element (Number/Name)<br>PE 0604532D8Z / *Joint Artificial Intelligence* | Project (Number/Name)<br>006 / *Joint Artificial Intelligence* | |

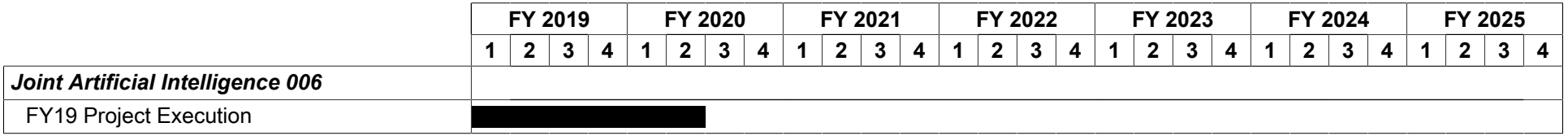
**Support ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Technical Engineering Services | C/Various | Various : Various | 70.000 | 12.968 | Jul 2019 | - | | - | | - | | - | Continuing | Continuing | - |
| | | **Subtotal** | 70.000 | 12.968 | | - | | - | | - | | - | Continuing | Continuing | N/A |

| | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | 70.000 | 12.968 | | 0.000 | | - | | - | | - | Continuing | Continuing | N/A |

**Remarks**

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604532D8Z / *Joint Artificial Intelligence* | **Project (Number/Name)**<br>006 / *Joint Artificial Intelligence* |



| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604532D8Z / *Joint Artificial Intelligence* | **Project (Number/Name)**<br>006 / *Joint Artificial Intelligence* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***Joint Artificial Intelligence 006*** | | | | |
| FY19 Project Execution | 1 | 2019 | 2 | 2020 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 4: *Advanced Component Development & Prototypes (ACD&P)* | **R-1 Program Element (Number/Name)**<br>PE 0604682D8Z / *Wargaming & Support for Strategic Analysis (SSA)* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 7.536 | 3.621 | 3.751 | 3.469 | - | 3.469 | 3.624 | 3.662 | 3.844 | 3.895 | Continuing | Continuing |
| 104: *Wargaming & Support for Strategic Analysis* | 7.536 | 3.621 | 3.751 | 3.469 | - | 3.469 | 3.624 | 3.662 | 3.844 | 3.895 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

A. Mission Description and Budget Item Justification

This program supports the Office of the Director, Cost Assessment & Program Evaluation (CAPE) by funding activities that help CAPE to implement warfighting analysis in support of the National Defense Strategy. CAPE accomplishes this by leading studies to support campaign analysis and analytical research across a spectrum of national security issues and concerns.

These RDT&E resources support critical studies and analyses to assist senior DoD leaders in optimally balancing the lethality, partnership, and reform levels of effort to carry out the National Defense Strategy.
The research agenda focuses on near- to long-term problems identified by the Deputy Secretary of Defense, and addresses difficult and complex questions linked to program alternatives for current and future capabilities and forces in order to enhance the senior leadership's deliberations and decision-making.

This program provides the scientific and technical engineering services needed for research studies in the development of models and simulations and the evaluation of current analytical tools and scientific methods used to evaluate and assess scenarios and concepts of operations (CONOPS) for a wide range of warfighting environments and scenarios. Deliverables from this program will include reports, briefings, and analyses designed to illuminate findings and assessments to inform OPLAN development and DoD's approach to concept development, evaluation, and force development.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 3.759 | 3.751 | 3.472 | - | 3.472 |
| Current President's Budget | 3.621 | 3.751 | 3.469 | - | 3.469 |
| Total Adjustments | -0.138 | 0.000 | -0.003 | - | -0.003 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | -0.001 | - | | | |
| • SBIR/STTR Transfer | -0.137 | - | | | |
| • Inflation Adjustment | - | - | -0.003 | - | -0.003 |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 4: *Advanced Component Development & Prototypes (ACD&P)* | **R-1 Program Element (Number/Name)**<br>PE 0604682D8Z *I Wargaming & Support for Strategic Analysis (SSA)* |

**Change Summary Explanation**

This program supports Warfighting, Campaign Analysis, and Support for Strategic Analysis to implement an important DoD priority in support of the National Defense Strategy. The FY 2021 reduction reflects: (1) the fiscal guidance provided for the current budget cycle: (2) Programmatic reductions directed in the Department's Defense Wide Review; and (3) Reductions reflecting revised inflation assumptions. .

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 4 | R-1 Program Element (Number/Name)<br>PE 0604682D8Z / *Wargaming & Support for Strategic Analysis (SSA)* | Project (Number/Name)<br>104 / *Wargaming & Support for Strategic Analysis* | |

| COST ($ in Millions) | Prior Years (+) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 104: *Wargaming & Support for Strategic Analysis* | 7.536 | 3.621 | 3.751 | 3.469 | - | 3.469 | 3.624 | 3.662 | 3.844 | 3.895 | Continuing | Continuing |
| Quantity of RDT&E Articles | | - | - | - | - | - | - | - | - | - | | |

(+) The sum of all Prior Years is $0.000 million less than the represented total due to several projects ending

**A. Mission Description and Budget Item Justification**

A. Mission Description and Budget Item Justification

This program supports the Office of the Director, Cost Assessment & Program Evaluation (CAPE). It funds activities that help CAPE to implement the vision of the Deputy Secretary of Defense to support new approaches to campaign analysis. CAPE will accomplish this by leading studies and developing analytic tools to think about future capabilities and posture.

This program provides for analytical research across a spectrum of issues and concerns. The research agenda is focused on near to long-term problems identified by the Deputy Secretary of Defense, and addresses difficult and complex questions linked to program alternatives for current and future capabilities and forces in order to enhance the senior leadership's deliberations and decision-making.

This program provides the scientific and technical engineering services needed for research studies in the development of models and simulations and the evaluation of current analytical tools and scientific methods used to evaluate and assess scenarios and concepts of operations (CONOPS) for a wide range of warfighting environments and scenarios. Deliverables from this program will include reports, briefings, and analyses designed to illuminate findings and assessments. Outcomes include the compilation and campaign analyses data to support the DOD capabilities to the challenges of a near-peer warfight.

| B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Wargaming & Support for Strategic Analysis | 3.621 | 3.751 | 3.469 |
| ***Articles:*** | 1 | 1 | 1 |
| ***Description:*** This program provides for analytical research across a spectrum of issues and concerns. The research agenda is focused on near- to long-term problems identified by the Deputy Secretary of Defense, and addresses difficult and complex questions linked to program alternatives for current and future capabilities and forces in order to enhance the senior leadership's deliberations and decision-making. | | | |
| ***FY 2020 Plans:***<br>Studies, analyses, and assessments will be focused on:<br>- Developing and refining warfighting objectives from senior leader priorities and Strategic Support Analysis activities.<br>- Overseeing planning, design, and assessments of the Services' preparation for the future warfight. | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604682D8Z / *Wargaming & Support for Strategic Analysis (SSA)* | **Project (Number/Name)**<br>104 / *Wargaming & Support for Strategic Analysis* |

| B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| - Leading, participating in, and assessing outcomes of campaign analyses<br>- Providing guidance to DoD on best practices for the warfight analysis<br>- Supporting warfighter planning products<br>***FY 2021 Plans:***<br>Studies, analyses, and assessments will be focused on:<br>- Developing and refining warfighting objectives from senior leader priorities and Strategic Support Analysis activities.<br>- Overseeing concept, analysis, and force design work<br>- Providing guidance to DoD on best practices for Service Concepts<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>FY 2021 maintains a virtual steady-state level of effort to support senior DoD leadership requirements, with a minor internal alignment reflecting FY 2021 fiscal guidance, as well as programmatic adjustments. | | | |
| **Accomplishments/Planned Programs Subtotals** | 3.621 | 3.751 | 3.469 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

A mix of competitive contracts with commercial firms and research provided by university-affiliated research centers (UARCs), and Federally Funded Research and Development Centers (FFRDCs).

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 4 | R-1 Program Element (Number/Name)<br>PE 0604682D8Z / *Wargaming & Support for Strategic Analysis (SSA)* | Project (Number/Name)<br>104 / *Wargaming & Support for Strategic Analysis* | |

**Product Development ($ in Millions)**

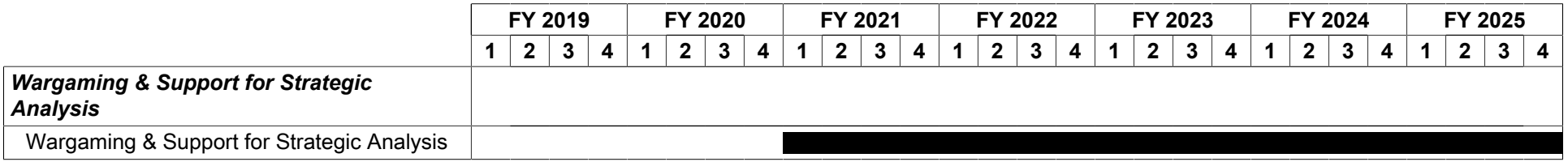
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Wargaming & Support for Strategic Analysis | C/Various | Various : DC Metro Area | 7.536 | 3.621 | Jan 2019 | 3.751 | Jan 2020 | 3.469 | Jan 2021 | - | | 3.469 | Continuing | Continuing | N/A |
| | | **Subtotal** | 7.536 | 3.621 | | 3.751 | | 3.469 | | - | | 3.469 | Continuing | Continuing | N/A |

| | Prior Years | FY 2019 | | FY 2020 | | FY 2021 Base | | FY 2021 OCO | | FY 2021 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | 7.536 | 3.621 | | 3.751 | | 3.469 | | - | | 3.469 | Continuing | Continuing | N/A |

**Remarks**

CAPE will accomplish this program by leading warfighting analysis, mission engineering threads, and analysis of concepts of operations. Funds will be awarded for high-priority projects based on competition, and the awards will include analysis of proposed costs.

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604682D8Z / *Wargaming & Support for Strategic Analysis (SSA)* | **Project (Number/Name)**<br>104 / *Wargaming & Support for Strategic Analysis* |



| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604682D8Z / *Wargaming & Support for Strategic Analysis (SSA)* | **Project (Number/Name)**<br>104 / *Wargaming & Support for Strategic Analysis* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***Wargaming & Support for Strategic Analysis*** | | | | |
| Wargaming & Support for Strategic Analysis | 1 | 2021 | 4 | 2025 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 4: *Advanced Component Development & Prototypes (ACD&P)* | **R-1 Program Element (Number/Name)**<br>PE 0604775D8Z / *Defense Rapid Innovation Program* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 250.000 | 241.194 | 0.000 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| 775: *Defense Rapid Innovation Program* | 250.000 | 241.194 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

The Defense Rapid Innovation Program (RIP) was established in Section 1073 of the FY 2011 National Defense Authorization Act (NDAA) and authorized as a permanent program in the FY 2017 NDAA. Section 224 of the FY 2019 NDAA codified the RIP in the U.S. Code as Title 10, Section 2359a (TAB B). The RIP accelerates the fielding of innovative technologies into military systems via a competitive, merit-based selection process. Technology innovations are drawn from Phase II Small Business Innovative Research (SBIR) projects, defense laboratory and academia efforts, and other innovative technologies, including dual-use and Independent Research & Development (IRAD) technologies. Projects stimulate innovation, mitigate technical risks, reduce acquisition and/or lifecycle costs, improve test outcomes, and rapidly insert technology into major acquisition programs and other programs that meet critical national security needs. RIP provides a mechanism for bridging the "Valley of Death" by funding the integration work vital to transition technologies out of the laboratory and into Programs of Record. Since inception, RIP has evaluated over 20,000 industry submitted white papers by companies from all 50 states and funded over 900 projects across 26 different organizations in the Military Services, Combatant Commands, and other Defense Agencies.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 249.432 | 0.000 | 0.000 | - | 0.000 |
| Current President's Budget | 241.194 | 0.000 | 0.000 | - | 0.000 |
| Total Adjustments | -8.238 | 0.000 | 0.000 | - | 0.000 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | -8.194 | - | | | |
| • Other Adjustments | -0.044 | - | - | - | - |

| Congressional Add Details ($ in Millions, and Includes General Reductions) | FY 2019 | FY 2020 |
|---|---|---|
| **Project:** 775: *Defense Rapid Innovation Program* | | |
| Congressional Add: *Defense Rapid Innovation Fund* | 241.194 | 0.000 |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 4: *Advanced Component Development & Prototypes (ACD&P)* | **R-1 Program Element (Number/Name)**<br>PE 0604775D8Z / *Defense Rapid Innovation Program* |

| Congressional Add Details ($ in Millions, and Includes General Reductions) | FY 2019 | FY 2020 |
|---|---|---|
| Congressional Add Subtotals for Project: 775 | 241.194 | 0.000 |
| Congressional Add Totals for all Projects | 241.194 | 0.000 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 4 | R-1 Program Element (Number/Name)<br>PE 0604775D8Z / *Defense Rapid Innovation Program* | Project (Number/Name)<br>775 / *Defense Rapid Innovation Program* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 775: *Defense Rapid Innovation Program* | 250.000 | 241.194 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

From FY 2011 thru FY 2019, the RIP has been funded through Congressional Adds.

RIP funds are distributed among the Services (Army, Navy, and Air Force) and the other Defense agencies. RIP is executed via a competitive two-step process for participation in the program. Industry participants are invited to submit a three-page white paper plus a quad chart through an annual Broad Agency Announcement (BAA). Once white papers are reviewed, the highest ranking white papers are invited to submit full detailed proposals for funding consideration. In ranking white papers, preference is given to projects focusing on the Research and Engineering top 10 research priorities, the National Defense Strategy, and small businesses. Full proposals are subject to final review and the highest ranking proposals are selected for contract award. The statute for RIP defines project scope as not to exceed 24 months and $3.000 million per project.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 |
|---|---|---|
| ***Congressional Add:*** Defense Rapid Innovation Fund | 241.194 | 0.000 |
| ***FY 2019 Accomplishments:*** In first quarter FY 2019, a department-wide call for technology requirement topics was issued. In second quarter FY 2019, Washington Headquarters Services issued a consolidated FY 2019 RIP BAA containing over 300 technology requirement topics from the Military Services, Combatant Commands, and other Defense Agencies. In second and third quarters FY 2019, 2,212 industry white papers were received and reviewed. Final proposals and project selections are anticipated in fourth quarter FY 2019. Over 100 FY 2019 RIF contract awards are anticipated by second quarter FY 2020. | | |
| ***FY 2020 Plans:*** The Department-wide call for FY 2020 technology requirement topics will be issued in fourth quarter FY 2019. The BAA is planned for first quarter FY 2020. Final project selections will be made by fourth quarter FY 2020 and awarded by second quarter FY 2021. | | |
| **Congressional Adds Subtotals** | 241.194 | 0.000 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604775D8Z / *Defense Rapid Innovation Program* | **Project (Number/Name)**<br>775 / *Defense Rapid Innovation Program* |

**D. Acquisition Strategy**

Successful RIP projects can transition to acquisition via several ways including, but not limited to:
1) technology upgrade insertion into a current platform or program providing greater capability, reduced lifecycle costs, or prolonging the life of the weapon system;
2) informing/refining future requirements providing better outcomes for planned systems; or 3) a direct transition/procurement should the item/article provide a new capability.

E. Performance Metrics

Each RIP project is evaluated at its conclusion based on two measures: 1) technical performance, or extent the RIP project is meeting its technical goals, with an assessment of cost, schedule, and deliverables against stated objectives; and 2) transition status, or the extent to which an acquisition program or customer has been identified and is participating in procuring the technology, assuming the RIP project is successful.

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 4 | R-1 Program Element (Number/Name)<br>PE 0604775D8Z / *Defense Rapid Innovation Program* | Project (Number/Name)<br>775 / *Defense Rapid Innovation Program* | |

**Product Development ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RIF Project Awards | C/Various | Multiple : Multiple | 245.475 | 237.231 | | - | | - | | - | | - | Continuing | Continuing | - |
| | | **Subtotal** | 245.475 | 237.231 | | - | | - | | - | | - | Continuing | Continuing | N/A |

**Support ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Intramural Support Costs | MIPR | Army, Navy, and Air Force : Multiple | 3.500 | 3.413 | | - | | - | | - | | - | Continuing | Continuing | - |
| | | **Subtotal** | 3.500 | 3.413 | | - | | - | | - | | - | Continuing | Continuing | N/A |

**Management Services ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RIF Program Support Services and Portal Costs | C/Various | Multiple : Multiple | 1.025 | 0.550 | | - | | - | | - | | - | Continuing | Continuing | - |
| | | **Subtotal** | 1.025 | 0.550 | | - | | - | | - | | - | Continuing | Continuing | N/A |

**Remarks**

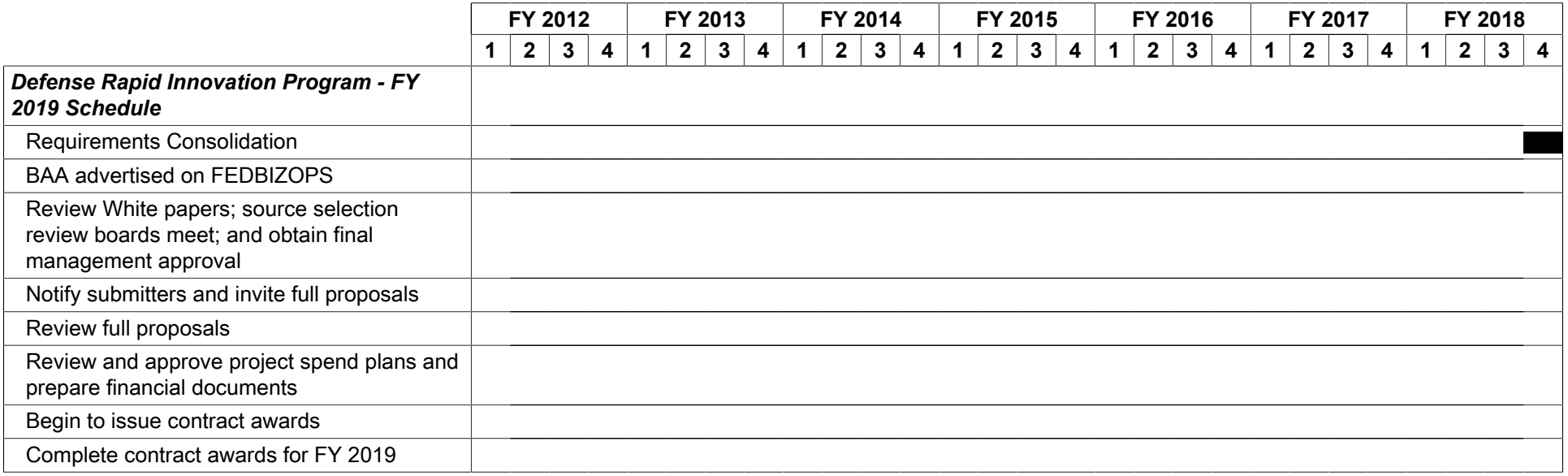
Administrative costs for executing RIP, program-wide, are two percent of the total appropriation per fiscal year.

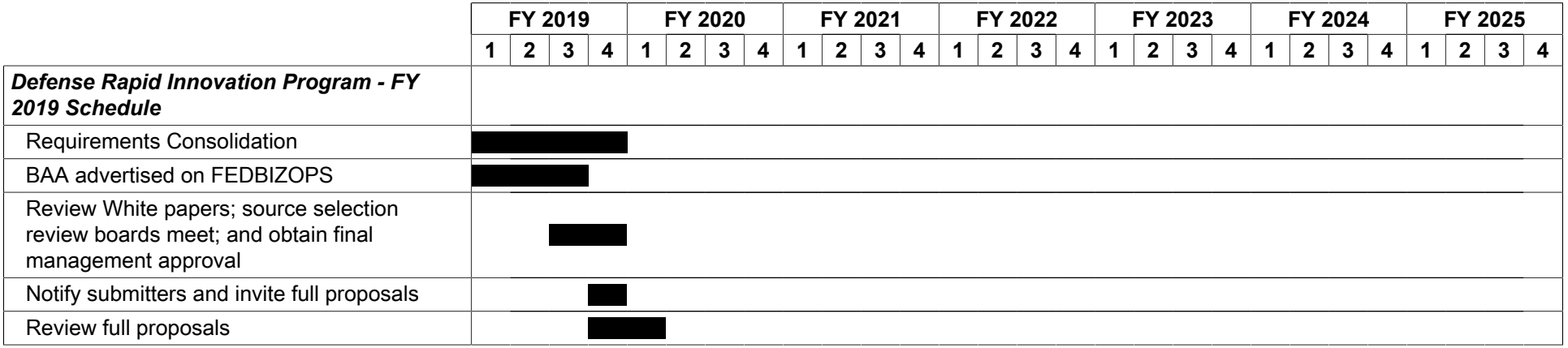
| | Prior Years | FY 2019 | | FY 2020 | | FY 2021 Base | | FY 2021 OCO | | FY 2021 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | 250.000 | 241.194 | | 0.000 | | - | | - | | - | Continuing | Continuing | N/A |

**Remarks**

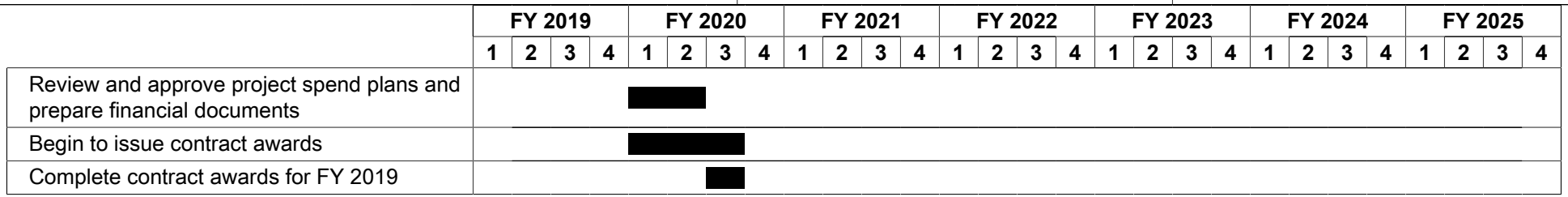
Administrative costs for executing RIF, program-wide, are two percent of the total appropriation per fiscal year.

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604775D8Z / *Defense Rapid Innovation Program* | **Project (Number/Name)**<br>775 / *Defense Rapid Innovation Program* |



| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604775D8Z / *Defense Rapid Innovation Program* | **Project (Number/Name)**<br>775 / *Defense Rapid Innovation Program* |



| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0604775D8Z / *Defense Rapid Innovation Program* | **Project (Number/Name)**<br>775 / *Defense Rapid Innovation Program* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***Defense Rapid Innovation Program - FY 2019 Schedule*** | | | | |
| Requirements Consolidation | 4 | 2018 | 4 | 2019 |
| BAA advertised on FEDBIZOPS | 1 | 2019 | 3 | 2019 |
| Review White papers; source selection review boards meet; and obtain final management approval | 3 | 2019 | 4 | 2019 |
| Notify submitters and invite full proposals | 4 | 2019 | 4 | 2019 |
| Review full proposals | 4 | 2019 | 1 | 2020 |
| Review and approve project spend plans and prepare financial documents | 1 | 2020 | 2 | 2020 |
| Begin to issue contract awards | 1 | 2020 | 3 | 2020 |
| Complete contract awards for FY 2019 | 3 | 2020 | 3 | 2020 |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 4: *Advanced Component Development & Prototypes (ACD&P)* | **R-1 Program Element (Number/Name)**<br>PE 0303191D8Z / *Joint Electromagnetic Technology (JET) Program* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 13.985 | 3.096 | 3.191 | 0.997 | - | 0.997 | 0.997 | 0.997 | 0.997 | 0.997 | Continuing | Continuing |
| 192: *Joint Electromagnetic Technology (JET) Program* | 13.985 | 3.096 | 3.191 | 0.997 | - | 0.997 | 0.997 | 0.997 | 0.997 | 0.997 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

The JET Program supports the Defense Community in actively pursuing technical and regulatory solutions that benefit the DoD while also understanding the ever-changing global telecommunication market and subsequent technology trends to support robust public policy deliberations and decisions. This program supports the Defense Community in general with a particular emphasis Electromagnetic Spectrum (EMS) Operations, band assessments, and technology assessments to effectively support the Department's efforts to procure and field new capabilities. Details of the program are classified.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 3.097 | 3.191 | 3.237 | - | 3.237 |
| Current President's Budget | 3.096 | 3.191 | 0.997 | - | 0.997 |
| Total Adjustments | -0.001 | 0.000 | -2.240 | - | -2.240 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | - | - | | | |
| • Financing Cancelled Account | -0.001 | - | - | - | - |
| • DWR | - | - | -2.237 | - | -2.237 |
| • Economic Assumptions | - | - | -0.003 | - | -0.003 |

**Change Summary Explanation**

FY19: Reprogramming FY19 Financing Cancelled Account Reduction -0.001 million.
FY21:The FY 2021 funding request was reduced by $2.237 million during DWR to account for change in requirements, resulting in a reduced level of effort.
FY21: Defense-Wide Economic Assumptions -.003 million.

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** JET Program Initiatives | 3.096 | 3.191 | 0.997 |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 4: *Advanced Component Development & Prototypes (ACD&P)* | **R-1 Program Element (Number/Name)**<br>PE 0303191D8Z / *Joint Electromagnetic Technology (JET) Program* |

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***FY 2020 Plans:***<br>Program Planning and Support<br>***FY 2021 Plans:***<br>Program Planning and Support<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Program adjustment. | | | |
| **Accomplishments/Planned Programs Subtotals** | 3.096 | 3.191 | 0.997 |

**D. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**E. Acquisition Strategy**

N/A

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0303191D8Z / *Joint Electromagnetic Technology (JET) Program* | **Project (Number/Name)**<br>192 / *Joint Electromagnetic Technology (JET) Program* |

**Support ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Technical Engineering Services | Option/ FFP | Various : Various | 12.089 | 1.000 | Jul 2019 | 1.200 | Jul 2020 | - | | - | | - | - | - | - |
| | | **Subtotal** | 12.089 | 1.000 | | 1.200 | | - | | - | | - | - | - | N/A |

**Management Services ($ in Millions)**

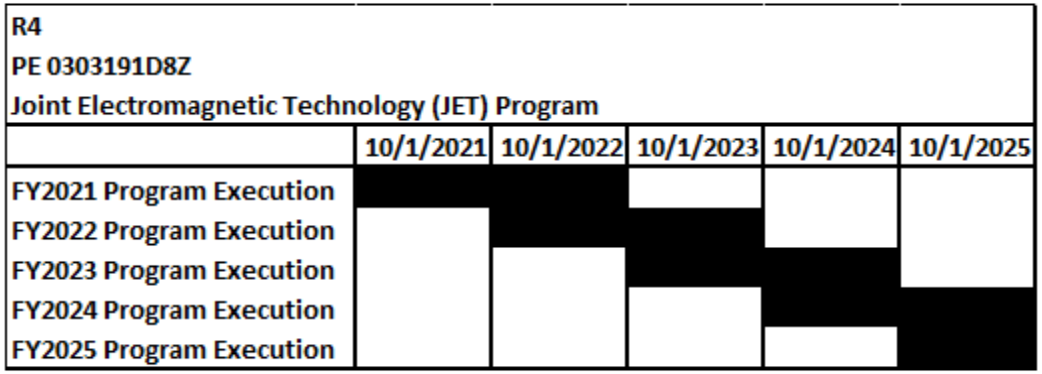
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Program Management Support | C/Various | Various : Various | 1.000 | 1.099 | Jul 2019 | 1.200 | Jul 2020 | - | | - | | - | - | - | - |
| Engineering Support FFRDC | Option/ Various | Various : Various | 0.896 | 0.997 | Jul 2019 | 0.791 | Jul 2020 | 0.997 | Jul 2021 | - | | 0.997 | Continuing | Continuing | - |
| | | **Subtotal** | 1.896 | 2.096 | | 1.991 | | 0.997 | | - | | 0.997 | Continuing | Continuing | N/A |

| | Prior Years | FY 2019 | | FY 2020 | | FY 2021 Base | | FY 2021 OCO | | FY 2021 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | 13.985 | 3.096 | | 3.191 | | 0.997 | | - | | 0.997 | Continuing | Continuing | N/A |

**Remarks**

NA

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0303191D8Z / *Joint Electromagnetic Technology (JET) Program* | **Project (Number/Name)**<br>192 / *Joint Electromagnetic Technology (JET) Program* |



| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 4 | **R-1 Program Element (Number/Name)**<br>PE 0303191D8Z / *Joint Electromagnetic Technology (JET) Program* | **Project (Number/Name)**<br>192 / *Joint Electromagnetic Technology (JET) Program* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ****** SUBPROJECT TITLE ****** | | | | |
| FY21 Project Execution | 3 | 2021 | 2 | 2022 |
| FY22 Project Execution | 1 | 2022 | 2 | 2023 |
| FY23 Project Execution | 1 | 2023 | 2 | 2024 |
| FY24 Project Execution | 1 | 2024 | 2 | 2025 |
| FY25 Project Execution | 1 | 2025 | 4 | 2025 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 5: *System Development & Demonstration (SDD)* | **R-1 Program Element (Number/Name)**<br>PE 0604161D8Z / *Nuclear and Conventional Physical Security/Countering Nuclear Threats* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 73.500 | 8.185 | 11.276 | 7.173 | - | 7.173 | 6.164 | 6.267 | 6.356 | 6.489 | Continuing | Continuing |
| 163: *Nuclear and Conventional Physical Security* | 61.782 | 3.853 | 7.855 | 7.073 | - | 7.073 | 6.164 | 6.267 | 6.356 | 6.489 | Continuing | Continuing |
| 042: *Countering Nuclear Threats (CNT) Prevention / System Development & Demonstration (SDD)* | 11.718 | 4.332 | 3.421 | 0.100 | - | 0.100 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

**Note**

N/A

**A. Mission Description and Budget Item Justification**

This Program Element (PE) addresses the need to defend and deter against weapons of mass destruction threats and to safeguard personnel; prevent unauthorized access to equipment, installations, material, and documents; and to safeguard the foregoing against espionage, sabotage, damage, and theft. This program oversees advanced engineering development and rapid fielding throughout the DoD for an integrated and systemic approach for countering nuclear threats and the development of nuclear and conventional physical security material solutions. Public Law, Presidential and DoD-level guidance, and Combatant Command and Service requirements drive the priorities for these programs.

Under this PE, funding associated with nuclear and convention physical security material solution for the Department is broken down into seven capability areas: (1) Detection and Assessment; (2) Access Controls; (3) Installation and Transport Security; (4) Storage and Safeguards; (5) Prevention; (6) Decision Support Systems; and (7) Analytical Support. The material solutions either (a) lead to a Programs of Record transitioning to Program Element 0604161D8Z for Systems Development and Demonstration; (b) become technology insertions into existing programs; or (c) advance to being a certified Commercial/Government off-the-shelf product. The Physical Security Enterprise and Analysis Group is responsible for avoiding duplication of effort, ensuring systems integration, and promoting interoperability and sustainability.

This PE can fund travel to support the requirements of this program.

This appropriation will finance work, including staffing, performed by a government agency or by private individuals or organizations under a contractual or grant arrangement with the government who conduct research, development, and test and evaluation efforts.

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 5: *System Development & Demonstration (SDD)* | **R-1 Program Element (Number/Name)**<br>PE 0604161D8Z *I Nuclear and Conventional Physical Security/Countering Nuclear Threats* |

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 8.314 | 11.276 | 7.386 | - | 7.386 |
| Current President's Budget | 8.185 | 11.276 | 7.173 | - | 7.173 |
| Total Adjustments | -0.129 | 0.000 | -0.213 | - | -0.213 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | -0.128 | - | | | |
| • Other Program Adjustments | - | - | -0.206 | - | -0.206 |
| • Cancelled Accounts | -0.001 | - | - | - | - |
| • Economic Assumption | - | - | -0.007 | - | -0.007 |

**Change Summary Explanation**

The decrease of $0.206 million is the result of planned program changes in OUSD(A&S).

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 5 | R-1 Program Element (Number/Name)<br>PE 0604161D8Z / *Nuclear and Conventional Physical Security/Countering Nuclear Threats* | Project (Number/Name)<br>163 / *Nuclear and Conventional Physical Security* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 163: *Nuclear and Conventional Physical Security* | 61.782 | 3.853 | 7.855 | 7.073 | - | 7.073 | 6.164 | 6.267 | 6.356 | 6.489 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

The Physical Security Enterprise & Analysis Program (PSEAP) conducts Technology and Engineering and Manufacturing Development throughout the Department of Defense for an integrated and systemic approach for nuclear and conventional physical security technology and systems. Priorities are driven by Combatant Command and Service requirements. This program is also addressing the Unmanned Systems threat by developing technology solutions that address the entire Kill Chain (Detect, Track, Identify, and Defeat) that are interoperable.

Funding associated with nuclear and convention physical security material solution for the Department is broken down into seven capability areas: (1) Detection and Assessment; (2) Access Controls; (3) Installation and Transport Security; (4) Storage and Safeguards; (5) Prevention; (6) Decision Support Systems; and (7) Analytical Support. The material solutions either (a) lead to a Programs of Record; (b) become technology insertions into existing programs; or (c) advance to being a certified Commercial/Government off-the-shelf product. The Physical Security Enterprise and Analysis Group is responsible for avoiding duplication of effort, ensuring systems integration, and promoting interoperability and sustainability.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Detection and Assessment | 2.076 | 3.585 | 4.073 |
| ***Description:*** The ability to detect an adversary and assess their intentions is a basic physical security tenant. This capability area will design equipment to identify and warn of unauthorized access to a specified area or installation as well as equipment related to the notification and identification of explosive threats or hazards.<br><br>Accomplishment: The PSEAP and the National Nuclear Security Administration are jointly developing a Portable Intrusion Detection System (PIDS) that addresses similar needs to protect nuclear weapons and special nuclear material. PIDS will provide a stable sensor platform that maintains the integrity of an existing secure perimeter in the event of sensor maintenance or system downtime. These include, but are not limited to, scheduled maintenance and upgrade activities for extended periods of time, or during emergency situations requiring the establishment of a National Defense Area; and mission requirements that dictate deployment of nuclear certified assets to locations that do not meet nuclear security requirements.<br><br>***FY 2020 Plans:*** | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604161D8Z / *Nuclear and Conventional Physical Security/Countering Nuclear Threats* | **Project (Number/Name)**<br>163 / *Nuclear and Conventional Physical Security* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| • Continue to test and evaluate commercial-off-the-shelf Indoor Gunshot Detection technologies in applications within DoD facilities.<br>• Continue to test and evaluate a Joint Interoperable Gateway for Security, Anti-terrorism and Warfighting command control display equipment capable of integrating/supporting the designated USAF physical security sensor and communication module.<br>***FY 2021 Plans:***<br>• Determine the ability of up to four commercially available handheld backscatter x-ray systems to detection improvised explosive devices, bulk explosives, and weapons.<br>• Expand the test and evaluation of explosive detection equipment to detect trace and bulk explosives through new technology advancements to include vapor detection.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The increase $0.295 million in FY 2021 is the result of planned program changes in OUSD(A&S). Projects and project cost vary from year to year. | | | |
| ***Title:*** Access Controls | 0.000 | 0.270 | 0.000 |
| ***Description:*** Controlling access to safeguard personnel and their families and to prevent unauthorized access to critical infrastructure and materials is paramount. This capability area will focus on programs and processes related to the validity and verification of individuals entering or already within, a facility.<br><br>Accomplishment: Defense Installation Access Control project enhances the Identity Matching Engine for Security & Analysis used at hundreds of DoD entry control points to compare Personal Identity Verification/Common Access Card holders against the National Crime Information Center and the Interstate Identification Index. Previous work developed a capability that compares DoD registered cardholders against the FBI's Wanted Persons File and against the Terrorist Screening Database. This capability prevents un-cleared people or potential terrorists from entering DoD installations. The updated system identified an individual with warrants for murder and aggravated assault with a deadly weapon trying to get installation access.<br>***FY 2020 Plans:***<br>• Evaluate application of radio-frequency identification technology to rapidly detect Biological Select Agents and Toxins (BSAT) in packages exiting Army BSAT laboratories' entry control points and shipping areas without opening the containers<br>***FY 2021 Plans:***<br>• The Combatant Commands and the Services did not identify any material needs for this Budget Activity/Capability Area.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:*** | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604161D8Z / *Nuclear and Conventional Physical Security/Countering Nuclear Threats* | **Project (Number/Name)**<br>163 / *Nuclear and Conventional Physical Security* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| The decrease in funding in FY 2021 is the result of planned program changes in OUSD(A&S). Projects and project cost vary from year to year. | | | |
| ***Title:*** Installation and Transport Security<br><br>***Description:*** Robust installation and transport security are vital to preventing a weapon of mass destruction attack or the unauthorized access to key assets such as nuclear weapons and special nuclear material. This capability area will focus on programs and equipment intended to improve the physical security profile of fixed sites and facilities, as well as critical items while in-transit.<br><br>Accomplishment: Joint Active Shooter Protection and Response project will integrate sensors to automatically detect indoor gunshots; provides potential victims, responders and authorized personnel with information to enhance situational awareness; and enable automatic or manual control of the building - inhibiting the shooter - shortening the duration of an active shooter. US Military Academy agreed to be used as a test bed for this effort and the results have wide ranging potential to be incorporated into soft or high value facilities.<br><br>***FY 2020 Plans:***<br>• The Combatant Commands and the Services did not identify any material needs for this Budget Activity/Capability Area.<br><br>***FY 2021 Plans:***<br>• The Combatant Commands and the Services did not identify any material needs for this Budget Activity/Capability Area.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>There was no change in funding from FY 2020 to FY 2021. | 0.329 | 0.000 | 0.000 |
| ***Title:*** Prevention<br><br>***Description:*** The security procedures taken to discourage an adversary from accessing weapons of mass destruction or gaining unauthorized access to critical assets are at the heart of prevention. This capability area will focus on broad spectrum, generic efforts which have the ability to influence multiple areas.<br><br>Accomplishment: Develop a Stabilized Crew-Served Heavy Machine Gun Mount by reviewing requirements, performing suitability testing, implementing design improvements, and demonstrating a field-able stabilized crew-served heavy machine gun mount for naval applications.<br><br>***FY 2020 Plans:*** | 0.639 | 0.000 | 0.000 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604161D8Z / *Nuclear and Conventional Physical Security/Countering Nuclear Threats* | **Project (Number/Name)**<br>163 / *Nuclear and Conventional Physical Security* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| • The Combatant Commands and the Services did not identify any material needs for this Budget Activity/Capability Area.<br>***FY 2021 Plans:***<br>• The Combatant Commands and the Services did not identify any material needs for this Budget Activity/Capability Area.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>There was no change in funding from FY 2020 to FY 2021. | | | |
| ***Title:*** Storage and Safeguards<br>***Description:*** Properly securing critical assets to prevent access by unauthorized persons and implementing control measures that ensure access is limited to authorized persons is the foundation of physical security. This capability area will focus on equipment (e.g., locks, doors, etc.) designed to delay or stop unauthorized entry/access to a specified/localized area.<br><br>Accomplishment: Combatant Commands and Service requirements did not dictate the need for System Development and Demonstration.<br>***FY 2020 Plans:***<br>• The Combatant Commands and the Services did not identify any material needs for this Budget Activity/Capability Area.<br>***FY 2021 Plans:***<br>• The Combatant Commands and the Services did not identify any material needs for this Budget Activity/Capability Area.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>There was no change in funding from FY 2020 to FY 2021. | 0.000 | 0.000 | 0.000 |
| ***Title:*** Decision Support Systems<br>***Description:*** Decision support systems serve the management, operations, and planning levels of the DoD physical security enterprise to help to make decisions, which may be rapidly changing and not easily specified in advance. This capability area will focus on command and control equipment and projects related to the creation and enhancement of common operating pictures, and the establishment of common architectures / interface standards.<br><br>Accomplishment: Platform for Integrated Command, Control, and Communications and Responsive Defense (PICARD) project is developing the next generation security system using an open fusion annunciator, a secure cloud infrastructure and integration with a mobile Common Operating Picture, to create a cost-effective sensor platform. This capability will eventually replace | 0.136 | 3.000 | 3.000 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604161D8Z / *Nuclear and Conventional Physical Security/Countering Nuclear Threats* | **Project (Number/Name)**<br>163 / *Nuclear and Conventional Physical Security* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| antiquated security systems that are based on high cost sensor technology with low-cost sensors used in fields like the automotive industry.<br><br>***FY 2020 Plans:***<br>• Demonstrate the feasibility of the PICARD backbone architecture by integrating a small set of representative sensors through the fusion annunciator to a selected common operating picture.<br>***FY 2021 Plans:***<br>• Complete the initial development of the PICARD project by testing and evaluating in an operationally relevant environment.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>There was no change in funding from FY 2020 to FY 2021. | | | |
| ***Title:*** Analytical Support<br>***Description:*** This capability area will focus on studies related to physical security topics and operational and management efforts related to day-to-day activities of the DoD Physical Security Enterprise RDT&E Program.<br><br>Accomplishment: The Maritime Expeditionary & Transit Security project demonstrated and evaluated how advanced non-lethal weapons technology employed for extended range will enhance and improve response capabilities for the transit protection mission. This project also determined how a flexible and scalable precision fire weapons system capability enhances/augments the current use of crew served weapons to counter fast approaching surface threats during High Value Unit transits.<br><br>***FY 2020 Plans:***<br>• Complete research, development and test interoperability bridges for the Security Equipment Integration Working Group (PSEAG standard used by Air Force and Marine Corps) and Integrated Sensor Architecture (Army's standard) based interface standards to determine if they are interoperable.<br>***FY 2021 Plans:***<br>• The Combatant Commands and the Services did not identify any material needs for this Budget Activity/Capability Area.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The FY 2020 decrease from $1.000 million to $0.200 million in FY 2021 is the result of planned program changes in OUSD(A&S). Projects and project cost vary from year to year. | 0.673 | 1.000 | 0.000 |
| **Accomplishments/Planned Programs Subtotals** | 3.853 | 7.855 | 7.073 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604161D8Z / *Nuclear and Conventional Physical Security/Countering Nuclear Threats* | **Project (Number/Name)**<br>163 / *Nuclear and Conventional Physical Security* |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

NA

**D. Acquisition Strategy**

N/A

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604161D8Z / *Nuclear and Conventional Physical Security/Countering Nuclear Threats* | **Project (Number/Name)**<br>163 / *Nuclear and Conventional Physical Security* |

**Product Development ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Physical Security - Product Development Prior Years | Various | Various : Various | 52.256 | - | | - | | - | | - | | - | - | - | - |
| Indoor Gunshot Detection System | MIPR | SPAWAR Atlantic : Charleston, SC | 0.718 | 0.208 | | - | | - | | - | | - | - | - | - |
| Trace Explosive Detection System Improvement | MIPR | EOD Tech Division : Indian Head, MD | 0.526 | 0.826 | | - | | - | | - | | - | - | - | - |
| Stablized Crew-Served Heavy Machine Gun Mount | MIPR | NSWC Crane : Crane, IN | - | 0.329 | | - | | - | | - | | - | - | - | - |
| JIGSAW - TASS Integration | MIPR | Multiply Performers : Multiple Locations | 0.776 | 0.607 | | - | | - | | - | | - | - | - | - |
| Platform for Integrated C3 and Responsive Defense | MIPR | Air Force Technical Applications : Patrick AFB, Florida | - | - | | 3.000 | | 3.000 | | - | | 3.000 | Continuing | Continuing | - |
| | | **Subtotal** | 54.276 | 1.970 | | 3.000 | | 3.000 | | - | | 3.000 | Continuing | Continuing | N/A |

**Remarks**

NA

**Test and Evaluation ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Physical Security - Test & Evaluation Prior Years | Various | Multiple : Multiple | 3.600 | - | | - | | - | | - | | - | - | - | - |
| PSEAG T&E | MIPR | SPAWAR Atlantic : Charleston, SC | 0.773 | 0.123 | | - | | - | | - | | - | - | - | - |
| Comparative Colorimetric | MIPR | EOD Tech Division : Indian Head, MD | 1.150 | 0.937 | | - | | - | | - | | - | - | - | - |

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604161D8Z / *Nuclear and Conventional Physical Security/Countering Nuclear Threats* | **Project (Number/Name)**<br>163 / *Nuclear and Conventional Physical Security* |

**Test and Evaluation ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Stand-Off Weapon Defeat IPT | MIPR | NSWC Dahlgren Division : Dahlgren Division | 1.231 | 0.203 | | - | | - | | - | | - | - | - | - |
| C-UAS in the Homeland | MIPR | Multiple Performers : Multiple Locations | 0.752 | 0.620 | | - | | - | | - | | - | - | - | - |
| PSEAG Test & Evaluation | MIPR | TBD : TBD | - | - | | 1.270 | | 4.073 | | - | | 4.073 | Continuing | Continuing | - |
| Enhancing Biosecurity Surveillance | MIPR | USAMRIID : Fort Detrick, MD | - | - | | 0.270 | | - | | - | | - | - | - | - |
| Conventional X-ray for EOD Applications T&E | MIPR | EOD Tech Division : Indian Head, MD | - | - | | 0.569 | | - | | - | | - | - | - | - |
| Handheld Backscatter X-ray T&E | MIPR | EOD Tech Division : Indian Head, MD | - | - | | 0.798 | | - | | - | | - | - | - | - |
| Bulk Standoff T&E | MIPR | EOD Tech Division : Indian Head, MD | - | - | | 0.663 | | - | | - | | - | - | - | - |
| Surface Enhanced Raman Spectroscopy T&E | MIPR | EOD Tech Division : Indian Head, MD | - | - | | 0.856 | | - | | - | | - | - | - | - |
| Millimeter-Wave Onsite Evaluation | MIPR | EOD Tech Division : Indian Head, MD | - | - | | 0.429 | | - | | - | | - | - | - | - |
| | | **Subtotal** | 7.506 | 1.883 | | 4.855 | | 4.073 | | - | | 4.073 | Continuing | Continuing | N/A |

**Remarks**

NA

| | Prior Years | FY 2019 | | FY 2020 | | FY 2021 Base | | FY 2021 OCO | | FY 2021 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | 61.782 | 3.853 | | 7.855 | | 7.073 | | - | | 7.073 | Continuing | Continuing | N/A |

**Remarks**

NA

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604161D8Z / *Nuclear and Conventional Physical Security/Countering Nuclear Threats* | **Project (Number/Name)**<br>163 / *Nuclear and Conventional Physical Security* |

| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604161D8Z / *Nuclear and Conventional Physical Security/Countering Nuclear Threats* | **Project (Number/Name)**<br>163 / *Nuclear and Conventional Physical Security* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***Detection & Assessment*** | | | | |
| Detection & Assessment | 1 | 2012 | 4 | 2025 |
| ***Decision Support*** | | | | |
| Decision Support | 1 | 2012 | 4 | 2025 |
| ***Storage & Safeguards*** | | | | |
| Storage & Safeguards | 1 | 2012 | 4 | 2025 |
| ***Installation & Transport Security*** | | | | |
| Installation & transport Security | 1 | 2012 | 4 | 2025 |
| ***Prevention*** | | | | |
| Prevention | 1 | 2012 | 4 | 2025 |
| ***Access Control*** | | | | |
| Access Control | 1 | 2012 | 4 | 2025 |
| ***Analytical Support*** | | | | |
| Analytical Support | 4 | 2018 | 4 | 2025 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604161D8Z / *Nuclear and Conventional Physical Security/Countering Nuclear Threats* | **Project (Number/Name)**<br>042 / *Countering Nuclear Threats (CNT) Prevention / System Development & Demonstration (SDD)* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 042: *Countering Nuclear Threats (CNT) Prevention / System Development & Demonstration (SDD)* | 11.718 | 4.332 | 3.421 | 0.100 | - | 0.100 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

The Countering Nuclear Threats (CNT) Program is the integrated and layered program across the full range of the Department of Defense (DoD) to prevent, detect, respond to, and recover from radiological or nuclear (RN) incidents delivered through unconventional means, regardless of origin. It is also the only DoD Budget Activity 5 RDT&E Program Element focused on focused on improving CNT capabilities which addresses capability gaps identified by the Services, Combatant Commands, and the Joint Staff. These capabilities are necessary for the DoD to plan and execute effective operations against rogue regimes that pursue nuclear weapons.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** CNT Rad/Nuc Passive Defense | 4.332 | 3.421 | 0.100 |
| ***Description:*** Development of the Radiological Detection System (RDS) which will replace DoD's legacy radiological survey meters and provide DoD's first Joint solution to increase capability and reduce life-cycle costs and address OPERATION TOMODACHI lessons learned. Currently, the Army, Air Force, Marines, Navy, and Coast Guard are planning to procure in excess of 50,000 RDS units. The first systems will be fielded starting in FY2020 to support an Army Operational Needs Statement.<br><br>***FY 2020 Plans:***<br>- Continue the development of RDS systems and achieve a Full Rate Production decision and material release to support procurement by Services.<br><br>***FY 2021 Plans:***<br>- Complete the development of RDS and transition to Service Component procurement plans (~$15.0 million).<br>- Identify maturing RDT&E projects that support the development of improved DoD CNT capabilities and transfer to Service Components.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The FY 2021 decrease from $3.421 million to $0.100 million is based on funding fluctuation and availability. | | | |
| **Accomplishments/Planned Programs Subtotals** | 4.332 | 3.421 | 0.100 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604161D8Z / *Nuclear and Conventional Physical Security/Countering Nuclear Threats* | **Project (Number/Name)**<br>042 / *Countering Nuclear Threats (CNT) Prevention / System Development & Demonstration (SDD)* |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 5 | R-1 Program Element (Number/Name)<br>PE 0604161D8Z / *Nuclear and Conventional Physical Security/Countering Nuclear Threats* | Project (Number/Name)<br>042 / *Countering Nuclear Threats (CNT) Prevention / System Development & Demonstration (SDD)* | |

**Product Development ($ in Millions)**

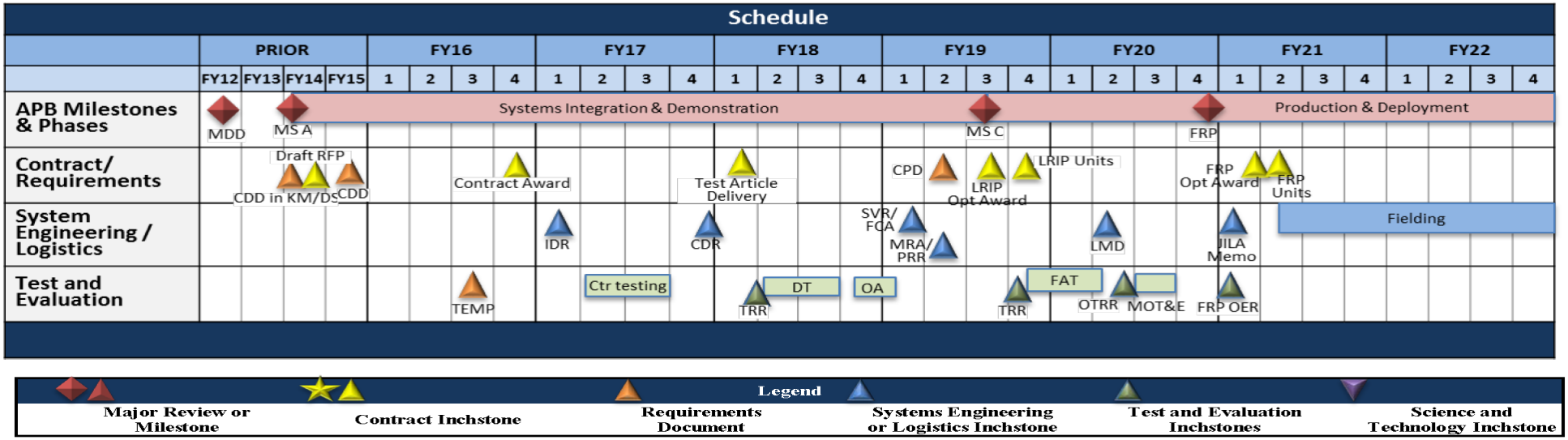
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Radiological Detection System | Sub Allot | JPEO CBD : Aberdeen, MD | 1.901 | 4.332 | | 3.421 | | 0.100 | | - | | 0.100 | Continuing | Continuing | - |
| Joint Personal Dosimeter | Sub Allot | JPEO CBD : Aberdeen, MD | 9.817 | - | | - | | - | | - | | - | Continuing | Continuing | - |
| Active Prevention System | TBD | TBD : TBD | - | - | | - | | - | | - | | - | Continuing | Continuing | - |
| | | **Subtotal** | 11.718 | 4.332 | | 3.421 | | 0.100 | | - | | 0.100 | Continuing | Continuing | N/A |

| | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | 11.718 | 4.332 | | 3.421 | | 0.100 | | - | | 0.100 | Continuing | Continuing | N/A |

**Remarks**

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604161D8Z / *Nuclear and Conventional Physical Security/Countering Nuclear Threats* | **Project (Number/Name)**<br>042 / *Countering Nuclear Threats (CNT) Prevention / System Development & Demonstration (SDD)* |

## *Radiological Detection System*



| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604161D8Z / *Nuclear and Conventional Physical Security/Countering Nuclear Threats* | **Project (Number/Name)**<br>042 / *Countering Nuclear Threats (CNT) Prevention / System Development & Demonstration (SDD)* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***Radiological Detection System*** | | | | |
| Radiological Detection System | 1 | 2018 | 4 | 2021 |
| ***Joint Personal Dosimeter*** | | | | |
| Joint Personal Dosimeter | 4 | 2014 | 1 | 2018 |
| ***Active Prevention System*** | | | | |
| Active Prevention System | 1 | 2019 | 4 | 2025 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 5: *System Development & Demonstration (SDD)* | **R-1 Program Element (Number/Name)**<br>PE 0604165D8Z / *Prompt Global Strike Capability Development* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 1,595.236 | 525.670 | 151.000 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| 166: *Alternate Re-Entry System/ Warhead Engineering* | 1,595.236 | 525.670 | 51.000 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| 065: *Joint Hypersonics* | - | 0.000 | 100.000 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

**Note**

In FY 2021, the Prompt Global Strike program transfers to the Services for execution.

**A. Mission Description and Budget Item Justification**

This Program Element (PE) was established to develop and demonstrate technologies and applications that advance Conventional Prompt Global Strike (CPGS) warfighting capabilities. The program uses a national team with participation from multiple Services, Agencies, national research laboratories, and industry partners selected on a competitive basis. Program emphasis is on demonstrating component and subsystem technology maturity with risk reduction initiatives highlighted by flight tests. The program funds the design, development, and experimentation of boosters, payload delivery vehicles (PDVs), non-nuclear warheads, thermal protection systems, guidance systems, test range modernization, and mission planning and enabling capabilities. To support these development activities, the program procures modeling and simulation capabilities, ground testing, command and control interfaces, test range support, and launch system infrastructure. Additionally, expert resources address strategic policy and treaty issues. Flight and ground test outcomes drive program timing and DoD hypersonic budget investments.

The Hypersonic Prompt Global Strike Capability Development Program Element supports the National Defense Strategy's focus on technological advancements that enhance deterrence and increase strategic flexibility, freedom of action, and Joint Force lethality.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 465.852 | 107.000 | 0.000 | - | 0.000 |
| Current President's Budget | 525.670 | 151.000 | 0.000 | - | 0.000 |
| Total Adjustments | 59.818 | 44.000 | 0.000 | - | 0.000 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | -56.000 | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | 100.000 | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | 9.900 | - | | | |
| • SBIR/STTR Transfer | 0.000 | - | | | |
| • Reprogramming: Long Range Hypersonic Weapon (LRHW) | 50.000 | - | - | - | - |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 5: *System Development & Demonstration (SDD)* | **R-1 Program Element (Number/Name)**<br>PE 0604165D8Z / *Prompt Global Strike Capability Development* |

| | | | | | |
|---|---|---|---|---|---|
| • Other Program Adjustments | -0.082 | - | - | - | - |

| **Congressional Add Details ($ in Millions, and Includes General Reductions)** | **FY 2019** | **FY 2020** |
|---|---|---|
| **Project:** 166: *Alternate Re-Entry System/Warhead Engineering* | | |
| Congressional Add: *Thermal Protection Systems and Industrial Capacity: Accelerate CPS Technology Development Flight Demonstrations and increase in Thermal Protection Systems Industrial Capacity* | 203.500 | - |
| Congressional Add Subtotals for Project: 166 | 203.500 | - |
| **Project:** 065: *Joint Hypersonics* | | |
| Congressional Add: *Joint Hypersonics Transition Office* | - | 100.000 |
| Congressional Add Subtotals for Project: 065 | - | 100.000 |
| Congressional Add Totals for all Projects | 203.500 | 100.000 |

**Change Summary Explanation**

The FY 2019 reprogramming adjustments are the net of a $9.000 million reprogramming to provide additional investment in a classified program detailed in the R-2A project titled "Munitions Program", and a $50.000 million reprogramming to support a multi-year effort to accelerate the early deployment of a prototype for a mobile, land-based intermediate-range hypersonic weapon system.

The FY 2020 Congressional increase of $44.000 million is the net of a $100.000 million increase to establish the Joint Hypersonics Transition Office, a reduction of $31.000 million which is being redirected to Army Research, Development, Test & Evaluation (RDT&E) budget line 100, and a reduction of $25.000 million to the classified Munitions Program detailed in the R-2A.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 5 | R-1 Program Element (Number/Name)<br>PE 0604165D8Z / *Prompt Global Strike Capability Development* | Project (Number/Name)<br>166 / *Alternate Re-Entry System/Warhead Engineering* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 166: *Alternate Re-Entry System/ Warhead Engineering* | 1,595.236 | 525.670 | 51.000 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**Note**

In FY 2021, the Prompt Global Strike program transfers to the Services for execution.

**A. Mission Description and Budget Item Justification**

This Program Element (PE) was established to develop and demonstrate technologies and applications that advance Prompt Global Strike warfighting capabilities. The program uses a national team with participation from the Services, Agencies, national research laboratories, and involvement of industry. Program emphasis is on demonstrating component and subsystem technology maturity with risk reduction initiatives highlighted by flight tests. The program funds the design, development, and experimentation of boosters, payload delivery vehicles (PDVs), non-nuclear warheads, thermal protection systems, guidance systems, test range modernization, and mission planning and enabling capabilities. To support these development activities, the program procures modeling and simulation capabilities, ground testing, command and control interfaces, test range support, and launch system infrastructure. Additionally, expert resources address strategic policy and treaty issues. Flight and ground test outcomes drive program timing and DoD hypersonic budget investments.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Alternative Re-Entry System/Warhead Engineering and Delivery Vehicle Options/Development | 255.022 | 0.000 | - |
| ***Description:*** This effort will test and evaluate alternative booster and delivery vehicle options and will assess the feasibility of producing an affordable solution to fill the Prompt Global Strike capability gap. It will mature technologies that could lead to advanced systems with the following characteristics: effects on targets in a very short-period of time from execution order; non-ballistic flight over the majority of the flight path; positive control from launch to impact; adequate cross-range/maneuverability to avoid overflight issues; and controlled stage drop over Broad Ocean Area. The technologies developed will have cross-Service and cross-concept applicability and will be developed through close coordination among DoD components. This activity will support both ground and flight tests and provide all national data to inform a potential acquisition program.<br><br>FY 2019 funding designed, procured, and produced all necessary materials to conduct and execute the Flight Experiment 2 (FE-2) on schedule. FE-2 is the highest priority test element in the Conventional Prompt Strike (CPS) portfolio, with systems integration, production, and test data directly contributing to fielding an early operational capability. In addition, FY 2019 funds were expended preparing for Flight Test 3 (FT-3) and Flight Experiment 3 (FE-3), enhancing the pace of test launches, and serving to refine booster and glide body data immediately prior to operational production and fielding. FY 2019 funds were also invested to research and mature technologies critical to fielding effective hypersonic weapon systems. These include: ordnance research | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604165D8Z / *Prompt Global Strike Capability Development* | **Project (Number/Name)**<br>166 / *Alternate Re-Entry System/Warhead Engineering* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| (fuzing, effects and lethality); navigation, guidance, and control research to address operation in contested environments; test and evaluation research to improve the capabilities of broad ocean area test ranges; mission planning research; and structures and aerothermodynamics research.<br><br>Funding reprogrammed into this PE was leveraged to support development, systems engineering, program management, test execution and planning for the Army Long Range Hypersonic Weapon system.<br><br>***FY 2020 Plans:***<br>Complete U.S. industrial capacity improvements to produce components for Prompt Global Strike Common Hypersonic Glide Bodies.<br>FY 2020 funding plans, Prompt Global Strike will:<br>- Continue U.S. industrial capacity improvements to produce components for Prompt Global Strike Common Hypersonic Glide Bodies<br>- Continue to support Common Hypersonic Glide Body manufacturing, demonstration, test, and production efforts<br>- Support development of future flight test systems for Prompt Global Strike concepts as required<br>- Continue studies for future system development to examine cost, lethality, aerodynamic and thermal characteristics, command and control, operational aspects, and technology integrated product teams<br>- Update Technology Development Strategy and system engineering documentation based on updated Prompt Global Strike engineering and test data, trade studies, and on-going risk reduction/technology development efforts<br>- Continue Systems Engineering support to Prompt Global Strike program and acquisition<br>- FY 2020 funding will continue to support post flight analysis and reporting into FY 2021<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The funding profile decreases in FY 2021 because the Prompt Global Strike program transfers to the Services for execution. | | | |
| ***Title:*** Munitions Program<br>***Description:*** This is a classified munitions program. Additional information available upon request.<br><br>***FY 2020 Plans:***<br>Complete classified munitions program. Additional information available upon request.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The funding profile decreases in FY 2021 because this munitions program is complete in FY 2020. | 67.148 | 51.000 | - |
| **Accomplishments/Planned Programs Subtotals** | 322.170 | 51.000 | - |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604165D8Z / *Prompt Global Strike Capability Development* | **Project (Number/Name)**<br>166 / *Alternate Re-Entry System/Warhead Engineering* |

| | FY 2019 | FY 2020 |
|---|---|---|
| ***Congressional Add:*** Thermal Protection Systems and Industrial Capacity: Accelerate CPS Technology Development Flight Demonstrations and increase in Thermal Protection Systems Industrial Capacity<br><br>***FY 2019 Accomplishments:*** The enhancement added significantly to the ability to transition hypersonic production from the laboratory to industry. The investments will significantly increase thermal protection system industrial capacity, essential for economic production of glide bodies in operationally significant quantities. These funds also contributed to industry contracts to realize affordability and production improvements in hypersonic glide bodies, allowing for cost-effective production of more capable systems. The funds were also leveraged to establish an early land-based operational hypersonic capability in the Long-Range Hypersonic Weapon (LRHW), with contracts initiated for long-lead procurement of mobile transporter/erector/launcher (TEL), Command/Control equipment, and LRHW all-up round plus canister elements. Similarly, the funds have been utilized to establish an early sea-based Intermediate Range Conventional Prompt Strike capability, with both surface and sub-surface capability planned. In addition, funding has been invested in the creation of a Mach 10 Quiet Wind Tunnel at the University of Notre Dame, a necessary investment to facilitate future hypersonic research. | 203.500 | - |
| **Congressional Adds Subtotals** | 203.500 | - |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604165D8Z / *Prompt Global Strike Capability Development* | **Project (Number/Name)**<br>166 / *Alternate Re-Entry System/Warhead Engineering* |

**Test and Evaluation ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alternative Reentry System/Warhead Engineering and Delivery Vehicle Options/ Development | Allot | Army Space and Missile Defense Center/Navy Strategic Systems Program : Huntsville AL/Washington DC | 1,595.236 | 525.670 | | 51.000 | | - | | - | | - | Continuing | Continuing | - |
| | | **Subtotal** | 1,595.236 | 525.670 | | 51.000 | | - | | - | | - | Continuing | Continuing | N/A |

**Remarks**

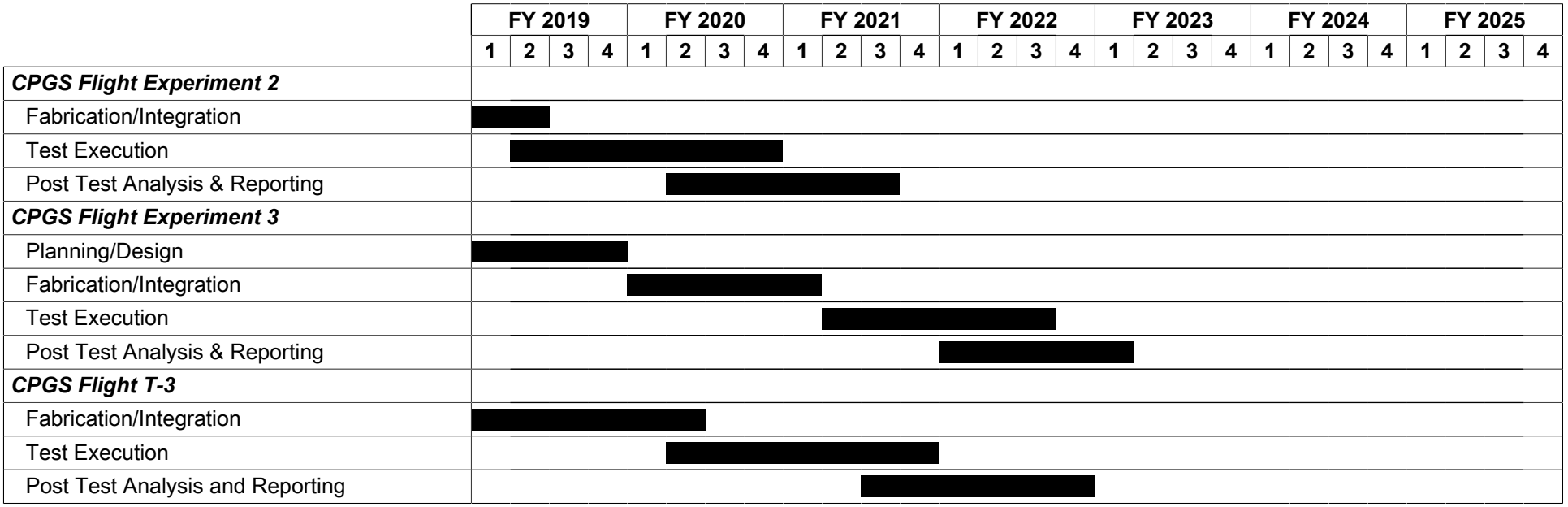
NA

| | Prior Years | FY 2019 | | FY 2020 | | FY 2021 Base | | FY 2021 OCO | | FY 2021 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | 1,595.236 | 525.670 | | 51.000 | | - | | - | | - | Continuing | Continuing | N/A |

**Remarks**

NA

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604165D8Z / *Prompt Global Strike Capability Development* | **Project (Number/Name)**<br>166 / *Alternate Re-Entry System/Warhead Engineering* |



| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604165D8Z / *Prompt Global Strike Capability Development* | **Project (Number/Name)**<br>166 / *Alternate Re-Entry System/Warhead Engineering* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***CPGS Flight Experiment 2*** | | | | |
| Fabrication/Integration | 1 | 2019 | 2 | 2019 |
| Test Execution | 2 | 2019 | 4 | 2020 |
| Post Test Analysis & Reporting | 2 | 2020 | 3 | 2021 |
| ***CPGS Flight Experiment 3*** | | | | |
| Planning/Design | 1 | 2019 | 4 | 2019 |
| Fabrication/Integration | 1 | 2020 | 1 | 2021 |
| Test Execution | 2 | 2021 | 3 | 2022 |
| Post Test Analysis & Reporting | 1 | 2022 | 1 | 2023 |
| ***CPGS Flight T-3*** | | | | |
| Fabrication/Integration | 1 | 2019 | 2 | 2020 |
| Test Execution | 2 | 2020 | 4 | 2021 |
| Post Test Analysis and Reporting | 3 | 2021 | 4 | 2022 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 5 | R-1 Program Element (Number/Name)<br>PE 0604165D8Z / *Prompt Global Strike Capability Development* | Project (Number/Name)<br>065 / *Joint Hypersonics* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 065: *Joint Hypersonics* | - | 0.000 | 100.000 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**Note**

The Joint Hypersonics project code was created in FY 2020 as a result of a Congressional add that highlighted the threats to national security posed by hypersonic weapons and called for the establishment of the Joint Hypersonics Transition Office.

**A. Mission Description and Budget Item Justification**

Create and implement the Joint Hypersonics Transition Office under the OUSD(R&E) Assistant Director, Hypersonics to develop and implement an integrated science and technology (S&T) roadmap for hypersonics, establish a university consortium for hypersonics research, develop the necessary workforce to support Department efforts to expedite testing, evaluation, and acquisition of hypersonic weapons systems, and coordinate current and future research, development, prototyping, test, and evaluation programs across the Department of Defense.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 |
|---|---|---|
| ***Congressional Add:*** Joint Hypersonics Transition Office | - | 100.000 |
| ***FY 2020 Plans:*** The Joint Hypersonics Transition Office will: 1) develop and implement an integrated science and technology roadmap for hypersonics, 2) establish a university consortium for hypersonics research, 3) develop a workforce to support Department efforts to expedite testing, evaluation, and acquisition of hypersonic weapons systems, and 4) coordinate current and future research, development, prototyping, test, and evaluation programs across the Department of Defense. | | |
| **Congressional Adds Subtotals** | - | 100.000 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

NA

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604165D8Z / *Prompt Global Strike Capability Development* | **Project (Number/Name)**<br>065 / *Joint Hypersonics* |

**Product Development ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hypersonics Road Map, university consortium and research/workforce development | TBD | TBD : TBD | - | - | | 100.000 | Mar 2020 | - | | - | | - | Continuing | Continuing | - |
| | | **Subtotal** | - | - | | 100.000 | | - | | - | | - | Continuing | Continuing | N/A |

**Remarks**

Resourcing and implementation of the Hypersonics Road Map, university consortium and research/workforce development is anticipated to be well into development by spring of 2020.

| | Prior Years | FY 2019 | | FY 2020 | | FY 2021 Base | | FY 2021 OCO | | FY 2021 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | - | - | | 100.000 | | - | | - | | - | Continuing | Continuing | N/A |

**Remarks**

Additional support costs, test and evaluation cost, management service costs and description of Joint funding will be detailed following the initiation and development of the Joint Hypersonics Transition Office.

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604165D8Z / *Prompt Global Strike Capability Development* | **Project (Number/Name)**<br>065 / *Joint Hypersonics* |

| | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | | FY 2025 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| ***Joint Hypersonics Transition Office*** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Initiation of Joint Hypersonics Transition Office work plan and estimated completion | | | | | | | | | [redacted] | | | | | | | | | | | | | | | | | | | |

| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604165D8Z / *Prompt Global Strike Capability Development* | **Project (Number/Name)**<br>065 / *Joint Hypersonics* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***Joint Hypersonics Transition Office*** | | | | |
| Initiation of Joint Hypersonics Transition Office work plan and estimated completion | 3 | 2020 | 4 | 2021 |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 5: *System Development & Demonstration (SDD)* | **R-1 Program Element (Number/Name)**<br>PE 0604771D8Z / *Joint Tactical Information Distribution System (JTIDS)* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 125.338 | 46.210 | 54.102 | 54.985 | - | 54.985 | 41.775 | 34.949 | 35.053 | 35.350 | Continuing | Continuing |
| 771: *Link-16 Tactical Data Link (TDL) Transformation* | 111.918 | 19.492 | 12.563 | 5.265 | - | 5.265 | 6.745 | 6.959 | 7.000 | 7.236 | Continuing | Continuing |
| 105: *Cyber Capability & Platform Resilience* | 13.420 | 26.718 | 26.539 | 36.742 | - | 36.742 | 32.030 | 24.990 | 25.053 | 25.114 | Continuing | Continuing |
| 028: *Cybersecurity: Cybersecurity Maturity Model Certification (CMMC) and Pathfinders* | 0.000 | 0.000 | 15.000 | 12.978 | - | 12.978 | 3.000 | 3.000 | 3.000 | 3.000 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

This program provides in-depth technical, engineering, integration support, and system of system analysis for space, missile defense, cyber, C4ISR, NC3, and nuclear weapons program portfolio management.

- Command, Control, Communications, Computers and Intelligence, Surveillance, and Reconnaissance: Develop and maintain a roadmap to improve data link interoperability, data link waveform standards, and global enterprise capabilities, enabling resilient, survivable federated networks.
- Nuclear Forces (Nuclear Command, Control, and Communications (NC3)): Execute NC3 Enterprise Capability Portfolio Management on behalf of the Under Secretary of Defense for Acquisition and Sustainment (USD(A&S)).
- Cyberspace as a Warfighting Domain Acquisition support and portfolio management of cyber capabilities to assure resilient weapons systems and critical infrastructure; improved Defense Industrial Base cybersecurity; cyber mission force capabilities to conduct offensive and defensive cyber missions.
- Secure and Robust Mission Critical Software: Advance capabilities in both software-intensive warfighting systems and enterprise defense business systems; support agile acquisition software pilots
- Acquisition Staff Support: Provide advice to acquisition decision makers on strategies to develop, produce, and sustain Major Defense Acquisition Programs

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 5: *System Development & Demonstration (SDD)* | **R-1 Program Element (Number/Name)**<br>PE 0604771D8Z *I Joint Tactical Information Distribution System (JTIDS)* |

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 34.425 | 40.102 | 26.718 | - | 26.718 |
| Current President's Budget | 46.210 | 54.102 | 54.985 | - | 54.985 |
| Total Adjustments | 11.785 | 14.000 | 28.267 | - | 28.267 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | 14.000 | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | 12.500 | - | | | |
| • SBIR/STTR Transfer | -0.709 | - | | | |
| • NC3 PE Transfer | - | - | -3.689 | - | -3.689 |
| • Other Program Adjustments | - | - | -1.617 | - | -1.617 |
| • Cancelled Account | -0.006 | - | - | - | - |
| • Economic Assumption | - | - | -0.022 | - | -0.022 |
| • Defense Wide Review Adjustment | - | - | -1.405 | - | -1.405 |
| • Cyber Resilence Mission Assurance | - | - | 35.000 | - | 35.000 |

**Change Summary Explanation**

FY 2021 overall increase of is the result of planned program changes in OUSD (A&S).

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 5 | R-1 Program Element (Number/Name)<br>PE 0604771D8Z / *Joint Tactical Information Distribution System (JTIDS)* | Project (Number/Name)<br>771 / *Link-16 Tactical Data Link (TDL) Transformation* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 771: *Link-16 Tactical Data Link (TDL) Transformation* | 111.918 | 19.492 | 12.563 | 5.265 | - | 5.265 | 6.745 | 6.959 | 7.000 | 7.236 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

Provide in-depth technical, engineering, integration support, and system of system analysis for space, missile defense, cyber, C4ISR, NC3, and nuclear weapons program portfolio management.
– Command, Control, Communications, Computers and Intelligence, Surveillance, and Reconnaissance: Develop and maintain a roadmap to improve data link interoperability, data link waveform standards, and global enterprise capabilities, enabling resilient, survivable federated networks.
– Nuclear Forces (Nuclear Command, Control, and Communications (NC3)): Execute NC3 Enterprise Capability Portfolio Management on behalf of the Under Secretary of Defense for Acquisition & Sustainment (USD(A&S)).

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Common Joint Tactical Information Initiatives | 19.492 | 12.563 | 5.265 |

***Description:*** FY19 Accomplishments:

Projects supporting the Deputy Assistant Secretary of Defense for Information and Integration Portfolio Management (DASD(I&IPM)):

- Established the scope of the NC3 enterprise by developing the NC3 Portfolio Definition list comprised of 204 objects, which includes programs, facilities, and systems that support surveillance and warning, command and control, Satellite Communications, Terrestrial and transport, air and force delivery programs, and special access programs.
- Implemented and supported a new NC3 governance process consisting of semi-annual NC3 Enterprise Reviews co-chaired by the Deputy Secretary of Defense and the Vice Chairman of the Joint Chiefs of Staff to address critical NC3 capability gaps and targeted investment decisions.
- Developed an initial NC3 Integrated Master Schedule for NC3 portfolio areas to track dependencies among related programs and identified critical paths to high priority NC3 capabilities to support enterprise-wide decision making.
- Established portfolio reporting processes to support oversight of delayed acquisition programs by the Council on Oversight of the National Leadership Command, Control, and Communications System as required by the FY 2018 National Defense Authorization Act section 1654. Managed quarterly reporting and provided the semi-annual reports to congress as required by statute.
- Agile in Global Command & Control System Joint Enterprise (GCCS-JE) Program & Joint Planning and Execution Services (JPES) Program: As requested by DISA PEO, Program Manager, Lead Architect and Technical Staff, developed and delivered

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604771D8Z / *Joint Tactical Information Distribution System (JTIDS)* | **Project (Number/Name)**<br>771 / *Link-16 Tactical Data Link (TDL) Transformation* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| agile framework for GCCS-J Modernization. Gave agile dev and dev ops presentations and provided written material to PMO government and contactor staff. Provided technical presentations and analyses for Program Increment Planning, Data Interface Design Sessions, Software Demos, Development Team Retrospective Hot Wash, etc. Analyzed schedules and timelines provided by vendors and identified the risks involved and developed actions to mitigate these risks. Resulted in a restructure of GCCS modernization focusing on execution delivery.<br>- Joint Cyber Command and Control (JCC2) Portfolio Management (USD(A&S) is PSA): Provided technical and acquisition expertise to the Air Force Executive Agent in developing the initial JCC2 architecture, pilots, and acquisition strategy. Supported development of Joint Cyber C2 ICD and received formal approval. The Air Force JCC2 recently demonstrated situational awareness capability in a successful recent Service level CSB.<br>- Conducted the analysis and authored the Tactical Data Relay Business Case Analysis (BCA) final report supporting Airborne Intelligence Surveillance and Reconnaissance Data Transport Task Force. Resulted in sustainment of relay capability during FY20 PBR.<br>- Planned, prepared, managed and executed the Spectrum Efficient National Surveillance Radar (SENSR) Spectrum Pipeline Plan as the PSA for SENSR program Acquisition. Authored key documents and orchestrated DoD activities supporting the SENSR program.<br>- Completed Wideband communication services (WCS) Analysis of Alternatives (AoA) Final Report write-up & prepared WCS AoA Sufficiency Package staffing to USD(A&S); delivered Sufficiency Review request to D,CAPE. Prepared briefing and participated in WCS AoA Briefing to C4/Cyber FCB with the aim of Joint Staff endorsement as acquisition planning document. GAO declared the report comprehensive. ASD(A) recently signed acknowledgement memo to GAO.<br>- Prepared and briefed to Common Data Link (CDL) community and staffed an information memo to USD(A&S) regarding CDL waveform modernization status for FY 2019. Prepared and facilitated data call and prepared and briefed FY 2020 CDL modernization status for waveforms and crypto.<br>- Completed revision of JTNC Charter as lead contributor to align with responsibilities outlined in DSD memorandum Enhancing DoD's Joint tactical Networks and Datalinks Modernization, and to develop JTNC FY 2020 Management Plan and Tri-Service funding plan.<br>- Collected High Frequency (HF) Capability Portfolio Management (CPM) programs, terminals, recap plans, and budgets into current HF data set. Investigated 4G HF spec compliance of USMC's planned procurement of Harris AN/PRC-160 radios. Working to mitigate interoperability issues.<br>- Developed construct for an enterprise level Tactical Data Link (TDL) dataset to improve TDL portfolio management and analysis. Collected TDL community Capability Portfolio Management (CPM) programs, terminals, recap plans, budgets, etc. into current HF data set. Documented deficiency in acquisition and interoperability insight and prepared recommendation to USD(A&S) for stronger A&S engagement and advocacy across the joint community.<br>- Developed and delivered interoperability roadmap and capability assessment describing problem/challenges, COAs, and developed "road map" for US, NATO, and coalition partners. Co-chaired United States - France Communications Interoperability | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604771D8Z / *Joint Tactical Information Distribution System (JTIDS)* | **Project (Number/Name)**<br>771 / *Link-16 Tactical Data Link (TDL) Transformation* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Sub-Working Group with French counterparts to address interoperability with the United States and France 4th and 5th generation aircraft. Developed Terms of Reference and way-forward plan for execution—approved by the French counterpart.<br>- Evaluated five Army and Navy acquisition programs for compliance with Mid-Tier Acquisition (MTA) guidance. Prepared recommendations to the Assistant Secretary of Defense for Acquisition (ASD(A)) for his review of other programs and development of DoD's MTA policy.<br><br>Projects supporting the Deputy Assistant Secretary of Defense for Acquisition Enablers (DASD(AE)):<br><br>- Advanced Software - Provided Technical/Engineering support to agile acquisition pilots and new software pathways policy development, including support as administrator and curator for the online agile community of practice, provided subject matter expert contributions & Technical/Engineering support to individual agile acquisition pilots as pilot advisor, assisted pilot programs with development of their required program documentation, and provided agile coaching and training.<br>- Delivered 180-day status report & drafted final congressional pilot reports. Provided technical/ engineering support to agile acquisition pilots.<br>- Developed draft interim policy and guidance on a new software acquisition pathway for the Department.<br>- Created and executed a wargame to refine interim software acquisition policy with Services, Agencies, Office of the Secretary of Defense (OSD) Acquisition and Joint Staff stakeholders.<br>- Developed a draft Implementation Strategic Roadmap that identifies short, medium, and long-term goals for each of the Defense Science Board (DSB) recommendations.<br>- Developed practical approaches to encourage adoption of game-changing software development and sustainment approaches that will deliver capabilities that catalyze greater mission impact to the warfighter and Enterprise more rapidly while better controlling cost and improving resilience in the current and emerging cyber threat environment.<br>- In Agile Pilot Program, identified likely risk areas, developed risk reduction approaches, and proposed appropriate metrics for new programs that will better reflect the health of software programs undergoing modernization or in development.<br>- Provided technical analysis and support to Software Provenance and Supply Chain Risk Management (SCRM) policy development, including implementation plans for changes in statue, regulation, and management direction. Provided technical assessments and course of action recommendations to address cybersecurity engineering and risk management considerations in the procurement process. Upon request, provided technical expertise and industry assessments to facilitate development of standard procedures to institutionalize SCRM in the procurement process.<br>- DASD(AE) coordinated with USCYBERCOM, OGC, CIO, USD(I), DPC, and USD(P) on policy development and implementation of FY 2019 NDAA Section 889 and Section 889 waiver processes, which are currently in official coordination with the Services.<br>- DASD(AE) continues to coordinate with these offices and conduct threat assessments in bi-weekly Scoping and Mitigation meetings with DoD SCRM TAC. | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604771D8Z / *Joint Tactical Information Distribution System (JTIDS)* | **Project (Number/Name)**<br>771 / *Link-16 Tactical Data Link (TDL) Transformation* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| - DASD(AE) answered several direct SECDEF Requests for Information (RFIs) on Chinese and Russian software companies posing a risk to National Security Systems (NSS).<br>- DASD(AE) used 10 USC 2339a authorities to prohibit NSS use of a software company with foreign ownership control or influence concerns.<br><br>Projects supporting the Deputy Assistant Secretary of Defense for Platforms & Weapons Portfolio Management (DASD(P&WPM)):<br><br>- Provided advice to USD(A&S) and ASD(A) senior leaders on strategies to produce, develop, and sustain the F-35 Lightning II program and worldwide fleet of aircraft. F-35 is the DoD's largest and highest priority acquisition program. Provided expert acquisition/program support to enable Planning, Programming, Budgeting and Execution (PPBE) for the F-35 Program Objective Memorandum (POM) and overall program requirements development. Collaborated with OSD, JCS, F-35 JPO, Air Force, & Navy. Assisted with routine reports including 30-60-90 and 5-15 inputs to ASD(A) and OUSD(A&S). Participated in weekly F-35 Action Officer synchronization meetings and helped generate weekly F-35 sustainment reports. Provided support to monthly F-35 Acquisition Small Group meetings. Provided additional portfolio support to Director for Air Weapons and Platforms for general air platforms and weapons portfolio management.<br>- Launched ground combat vehicle portfolio manager position. Responded to GAO recommendations on Amphibious Combat Vehicle (ACV) and fact checked additional reports on the M1-A1 Abrams tank program. Participated in the Strategic Portfolio Review on Asymmetric China Response.<br>-Launched inaugural Air Defense Portfolio management position. Monitored Patriot and Short Range Air Defense programs as well as other associated and competing programs. Participated in initial efforts to establish the new Cruise Missile Defense of the Homeland cross functional team.<br>- Provided critical direct support and expertise to the Counter Unmanned Air Systems (CUAS) portfolio manager. Supported the stand-up of the CUAS Senior Integration Group, CUAS Executive Committee and multiple CUAS working groups. Synchronized CUAS efforts across the department to include all services. Reduced duplication of efforts and helped develop common standards. Provided periodic recommendations to OUSD(A&S) and DOD(CIO) on adjudicating Commercial Off-the-Shelf (COTS) UAS waivers on a bi-weekly basis.<br><br>***FY 2020 Plans:***<br>Projects supporting DASD(I&IPM):<br>- Common Data Link (CDL) Principal Staff Assistant: Continue to coordinate with CDL Executive Agent (EA) to develop and maintain a technology roadmap and terminal database to improve interoperability, configuration management, and focused technology investments. Continue implementation and oversight of an enterprise transition strategy to modernize DoD Intelligence, Surveillance and Reconnaissance (ISR) waveforms to converge on a DoD standard for tactical ISR communications. Update CDL technology development roadmap to reflect current trends in technology that can add enhanced capabilities to CDL | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604771D8Z / *Joint Tactical Information Distribution System (JTIDS)* | **Project (Number/Name)**<br>771 / *Link-16 Tactical Data Link (TDL) Transformation* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| systems. Continue to plan and conduct CDL Senior Review Panel and IPT meetings to develop and refine the CDL investment portfolio and to identify strategic ISR communications issues the DoD will face in the future. Conduct analysis of Airborne ISR communications transport infrastructure in coordination with Joint Staff, Services and Combatant Commands in order to identify a way ahead for establishing an effective/efficient global enterprise capability. Expand the CDL Reference Implementation Laboratory concept of a government owned technical baseline while assessing a Common Development Environment that encourages rapid development, testing, and fielding of new capabilities.<br>- Ground Tactical Networks Advanced Capabilities: Mature narrow band dismounted communications capability with radio hardware prototype, robust modeling and simulation, and reusable waveform software code. Form industry engagement to promote transition into non-developmental item radios.<br>- Spectrum: Maintain situational awareness of and contribute to evolving DoD and Service Spectrum strategy, and in conjunction with EMSO efforts, assist in coordinating development of new and integrated enterprise capabilities. Provide technical and acquisition support for the Spectrum Efficient National Air Surveillance Radar (SENSR) system to ensure development and delivery of DoD requirements and acquisition artifacts to a Cross-Department activity led by the Federal Aviation Administration (FAA). Support includes integrating DoD stake-holders capabilities; working with FAA and the Department of Homeland Security; interfacing with North American Aerospace Defense Command, Air Combat Command, and the Services to ensure DoD equities; and providing acquisition expertise during the development of a request for proposal (include development of artifacts and source selection).<br>- Tactical Data Link Modernization: Provide OSD oversight and cross-Service coordination of Tactical Data Link (TDL) modernization issues currently under review as part of a larger DoD interoperability emphasis led by the Chief Information Office and the Joint Staff and in conjunction with USD(A&S)under the recently DSD formed governance council, C3LB. Support Interoperability working groups and cross functional teams for developing strategies for advanced technology development and fielding of data link capabilities. Track and assess testing of Link 16 capability improvements in Multi-function Information Distribution System (MIDS-J) terminals (4th Gen aircraft), Communications, Navigation & Identification (CNI) terminal in F-35, emerging 6th Gen aircraft concepts, and Weapons Data Link (WDL) radios. Assess transferability of these improvements to other omni-directional TDLs. Begin establishing an improved enterprise governance model for Tactical Data Links. Identify Multi-functional Data Link (MADL) evolution technology development needs for further funding to enable transition to F-35 and other platforms, and begin establishment of a Government Controlled Technical Baseline for MADL as briefed to USD(A&S). Assess modeling and simulation infrastructure and currency with adversary threat emitters to improve investment decisions on TDL improvements. Conduct DoD wide assessment of TDL Low Probability of Detection/Low Probability of Intercept waveforms and work with OSD and the Services on an executable acquisition strategy for modernization. Develop, with D/CIO and J6, robust waveform repository providing programmatic technical guidance to the Joint Tactical Network Center. Continue to enhance Link-16 and other waveforms by active engagement and leadership at the Joint Datalink Acquisition Working Group". Provide product support in CDL and Link-16 Crypto Modernization working with Service EAs and NSA. | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604771D8Z / *Joint Tactical Information Distribution System (JTIDS)* | **Project (Number/Name)**<br>771 / *Link-16 Tactical Data Link (TDL) Transformation* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| - Joint C2 Portfolio Management: Increase relevancy and enhance the relationship with the PM-CESG Program Managers and other members and the OSD and Joint Staff. Provide technical expertise in agile development processes and support C2 program including the Global C2 System-Joint Expanded (GCSS-JE) in the development of a comprehensive agile development strategy. Actively engage J6 in continuing development of JADC2. Provide technical expertise for ensuring C2 data are visible, accessible, understandable, trustworthy and interoperable.<br>- Strategic Deterrence: Support recapitalizing the nation's nuclear deterrent, driving risk reduction in nuclear modernization programs, enhancing sustainment of existing legacy nuclear capabilities, and implementing the Nuclear Posture Review.<br>- NC3 Capability Portfolio Management: Continues support to USD(A&S) in its roles as the Principal Staff Assistant (PSA) for Nuclear Command, Control, and Communications (NC3), the NC3 Enterprise Capability Portfolio Manager, and co-chair of the Council on Oversight of the National Leadership Command, Control, and Communications System (CONLC3S). Works with Services, DoD Components, USSTRATCOM Nuclear Enterprise Center, and CONCL3S Executive Secretariat (DOD CIO) to oversee all aspects of NC3 governance. This includes organizing capability reviews, directing performance of the acquisition system in support of NC3, developing investment and programming guidance, responding to congressionally-directed actions, completing NC3-related studies, analyses, and policy updates, and assessing DoD Component plans, programs, and budgets forbudget justification and execution.<br>- NC3 Analytical Support: Continue development, evaluation, and procurement of hardware and software to establish an NC3 program and capability analysis system. Continue enhancement of analytical tools to focus on NC3 capability evaluation. Complete technical studies to identify evolving data needs. Assess DoD Components plans for transitioning technology and modernizing existing NC3 systems. Identify and evaluate opportunities for inserting new technology into the NC3 system.<br>- DASD AE: Innovative Acquisition Approaches: Develop or enhance innovative acquisition approaches across hardware, software, IT infrastructure and services acquisition policy and processes to better align with best practices and modern technology approaches. Facilitate widespread adoption of rapid acquisition paths through translating lessons learned/best practices into policy, guidance, and training products and tools, working in partnership with the Acquisition Accelerator sponsored by Strategy Data & Design.<br>***FY 2021 Plans:***<br>- Common Data Link (CDL) Capability Portfolio Management (CPM): Continues to execute USD(A&S) roles as Principal Staff Assistant (PSA) for CDL. Work with DoD Components to maintain currency of the CDL technology roadmap and terminal database to prioritize commonality, open architecture, and non-proprietary systems for current and emerging platform, sensor, and weapons ISR data transport requirements. Conduct annual CDL enterprise modernization analysis and review Service PPBE submissions to assess enterprise migration off To Be Sunset (CDL-TBD) waveforms by 2023.<br>- Intelligence, Surveillance, and Reconnaissance Data Transport and Task, Process, Exploit and Disseminate Intelligence Information: Technical Support as the co-lead with USD(I) to modernize and migrate the DoD Distributed Common Ground family of systems to an enterprise capability. | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604771D8Z / *Joint Tactical Information Distribution System (JTIDS)* | **Project (Number/Name)**<br>771 / *Link-16 Tactical Data Link (TDL) Transformation* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| - Command, Control, and Communications Leadership Board (C3LB): As a Tri-Chair, provide strategic planning, prioritization, policy execution, resource review, and effective capability management and oversight of DoD C3 and Electromagnetic Spectrum (EMS) initiatives. Accelerate and synchronize fielding of modernized networking solutions across the joint force with the objective of establishing priorities and strategies that enable implementation across the DoD C3 and EMS enterprises.<br>- Joint Tactical Networking Center (JTNC): Provide technical and programmatic analysis to support DoD's rapid identification, characterization, procurement, fielding, and sustainment of modular, innovative tactical communications products that ensure secure, interoperable, and resilient C4ISR capabilities. Develop, with D/CIO and J6, robust waveform repository providing programmatic technical guidance to the JTNC. Continue to enhance Link-16 and other waveforms by active engagement and leadership at the Joint Datalink Acquisition Working Group". Provide product support in CDL and Link-16 Crypto Modernization working with Service EAs and NSA.<br>- Ground Tactical Networks Advanced Capabilities: Mature narrowband dismounted communications capability with radio hardware prototype, robust modeling and simulation, and reusable waveform software code. Pursue industry engagement to promote transition into non-developmental item radios.<br>- Integrated Electromagnetic Spectrum Operations (EMSO): Implement integrated transport, radio communications, and Electronic Warfare(EW)/EMSO capability development to ensure NDS objectives for integrated Spectrum operations and capabilities are met. Provide acquisition support to the Department's 5G strategy<br>- Spectrum: Provide executive guidance, technical expertise, and acquisition support for the Spectrum Efficient National Air Surveillance Radar (SENSR) system. Develop and deliver mission capability requirements and acquisition artifacts to the Joint Program Office (JPO)-led by the Federal Aviation Administration (FAA). In FY21 SENSR enters a critical stage with a Milestone B decision and initiation of acquisition with RFP release and source selection and prototype development.<br>- Tactical Datalink: Conduct assessment of TDL Low Probability of Detection/Low Probability of Intercept waveforms and work with the Services to create a TDL Modernization Roadmap and executable acquisition strategy for modernization in accordance with DEPSECDEF Memorandum "Enhancing DoD's Joint Tactical Networks and Datalink Modernization." Track and assess capability improvements in Multi-function Information Distribution System (MIDS) and F-35 Communications, Navigation & Identification (CNI) terminals, emerging 6th Gen aircraft and Weapons Data Link (WDL) concepts.<br>- Provide technical expertise for Joint All Domain Command and Control (JADC2) Architecture Operations Planning Team (OPT) and provide coordination and AO support for level reviews of JADC2 RA products as they are developed to support critical cross-functional team timelines and deliverables. OPT deliverable is JADC2 Reference Architecture documents and products ready for formal staffing.<br>- Strategic Deterrence: Support the recapitalizing the nation's nuclear deterrent, driving risk reduction in nuclear modernization programs, enhancing sustainment of existing legacy nuclear capabilities, and implementing the Nuclear Posture Review. | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604771D8Z / *Joint Tactical Information Distribution System (JTIDS)* | **Project (Number/Name)**<br>771 / *Link-16 Tactical Data Link (TDL) Transformation* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| - NC3: In the role as NC3 Capability Portfolio Manager (CPM), support the NC3 governance process to provide analysis to senior leadership bodies (NC3 Enterprise Review, Deputy's Management Action Group, SECDEF Weekly Priorities Review, etc.) and recommend investment and policy alternatives for decision.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>FY 2020 to FY 2021 decrease of $12.810 million dollar decrease is the result of multiple planned program changes in OUSD(A&S). A new Program Element (PE) was created for the Nuclear Forces (Nuclear Command, Control, and Communications (NC3) program and $3.689 million was moved from this PE to the new NC3 PE. Other decreases are a result of the OUSD(A&S) leadership decisions. | | | |
| **Accomplishments/Planned Programs Subtotals** | 19.492 | 12.563 | 5.265 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Utilize existing fixed-price and cost-plus contracts (where appropriate) to continue providing in-depth technical, engineering, integration support, and system of system analysis for space, missile defense, and C4ISR.

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604771D8Z / *Joint Tactical Information Distribution System (JTIDS)* | **Project (Number/Name)**<br>771 / *Link-16 Tactical Data Link (TDL) Transformation* | |

**Management Services ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Link-16 Tactical Data Link (TDL) Transformation | C/TBD | OUSD A&S DASD I&IPM : Pentagon | 111.918 | 19.492 | | 12.563 | Jan 2020 | 5.265 | Jan 2021 | - | | 5.265 | - | - | - |
| | | **Subtotal** | 111.918 | 19.492 | | 12.563 | | 5.265 | | - | | 5.265 | - | - | N/A |

**Remarks**

NA

| | Prior Years | FY 2019 | | FY 2020 | | FY 2021 Base | | FY 2021 OCO | | FY 2021 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | 111.918 | 19.492 | | 12.563 | | 5.265 | | - | | 5.265 | - | - | N/A |

**Remarks**

Resources will be used to provide technical, systems engineering and acquisition management oversight of programs, projects and activities to maximize the Department's return on investment in information technology resources and to affect a comprehensive approach for assessing and procuring critical information systems from initial design, through development to capability delivery in support of improved weapons systems performance and military operations.

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604771D8Z / *Joint Tactical Information Distribution System (JTIDS)* | **Project (Number/Name)**<br>771 / *Link-16 Tactical Data Link (TDL) Transformation* |

| | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | | FY 2025 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| ***Link-16 Comm Tactical Data Link (TDL) Transformation*** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Contract Awards | | | | | | | | | [redacted] | | | | | | | | | | | | | | | | | | | |

| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604771D8Z / *Joint Tactical Information Distribution System (JTIDS)* | **Project (Number/Name)**<br>771 / *Link-16 Tactical Data Link (TDL) Transformation* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***Link-16 Comm Tactical Data Link (TDL) Transformation*** | | | | |
| Contract Awards | 2 | 2019 | 4 | 2021 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 5 | R-1 Program Element (Number/Name)<br>PE 0604771D8Z / *Joint Tactical Information Distribution System (JTIDS)* | Project (Number/Name)<br>105 / *Cyber Capability & Platform Resilience* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 105: *Cyber Capability & Platform Resilience* | 13.420 | 26.718 | 26.539 | 36.742 | - | 36.742 | 32.030 | 24.990 | 25.053 | 25.114 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

Provides resources for developmental acquisition support and portfolio management in support of three primary Goals in support of the Department of Defense (DoD) Cyber Strategy
1) Trained and Equipped Cyber Mission Force
2) Cyber Hardened Weapon Systems and Critical Infrastructure
3) Enhanced Defense Industrial Base (DIB) Cyber Security

The Office of the Undersecretary of Defense for Acquisition and Sustainment (OUSD(A&S)) conducts mission engineering for cyberspace operations to inform and support the development of Joint Cyber capabilities as the Department conceives, develops, and rapidly fields cyber capabilities for Cyberspace Operations. The newly established OUSD(A&S) Chief Information Security Office (CISO) was created to improve planning, coordination, synchronization, and integration of cyber activities and increase DoD wide emphasis on reducing the cyber risk to critical DoD missions and enhancing DIB Cyber Security.

Funds provide technical, systems engineering, trend analysis, and portfolio management of programs, projects, and activities developing cyber capabilities to maximize the Department's return on investment of cyberspace resources and effect a comprehensive approach for assessing, procuring, and sustaining critical cyber capabilities and cyber resilient systems and platforms from initial design, through development to capability delivery in support of weapons systems performance and military operations.

Additionally, these funds will provide systems analyses, portfolio management, and executive support of Senior Cyber Leadership forums, enterprise wide systems engineering and operational impact analyses related to Cyber capabilities, enhancing cyber resilience within systems and platforms, and enhancing the cybersecurity of the DIB.

Resources will also be used to provide expertise required for exercising technical direction over design, performance, cost parameters, and determining and mitigating cyber risks of key systems and their dependencies. The goal of this funding is to assure capability advantage, reduce time to the field, evaluate projects and concepts, minimize cyber related performance and operational risk of developing and fielding complex systems, ensure program dependencies are documented and included in acquisition decisions, and address cyber security requirements, gaps, and required technical solutions.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Cyber Capability and Platform Resilience | 26.718 | 26.539 | 36.742 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604771D8Z / *Joint Tactical Information Distribution System (JTIDS)* | **Project (Number/Name)**<br>105 / *Cyber Capability & Platform Resilience* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Description:*** FY19 Accomplishments:<br>Goal 1: Trained and Equipped Cyber Mission Force<br>- Provided acquisition oversight of Cyber-related Joint Urgent and Emergent Operational Needs Statements in support of Combatant Command (CCMD) requirements.<br>- In collaboration with U.S. Cyber Command (USCYBERCOM), completed the initial DoD Cyberspace Operations Capability Strategic Roadmap for Fiscal Years 2020 – 2025<br>- In collaboration with USCYBERCOM, completed the 2019 initial Joint Cyber Warfighting Architecture (JCWA) enterprise architecture artifacts, overview and summary information, a system context model, and proposed an operational context diagram to USCYBERCOM.<br>- At the Top Secret/Sensitive Compartmented Information-level, collaborated with USCYBERCOM to conducted mission analysis of real world cyberspace operations and developing key insights to inform cyber capability development.<br>- Developed Cyber Mission Model Version 1.0. Validated and delivered the model to Army Cyber Command to support planning and execution of cyberspace operations.<br><br>Goal 2: Cyber Hardened Weapon Systems and Critical Infrastructure<br>- Tracked and provided oversight of DoD wide Service and Agency Cyber Vulnerability Assessment and Mitigations for Weapon Systems and Critical Infrastructure in support of National Defense Authorization Act (NDAA) FY 2016 - Section 1647 and NDAA FY 2017 – Section 1650.<br>- Planned and executed the Cyber Resilience III Wargame in support of US European Command (USEUCOM) and identified cyber risks to the USEUCOM Ballistic Missile Defense (BMD) Mission.<br>- Initiated development of the Cyber Defense Plan for USEUCOM BMD Mission<br>- Initiated planning for Cyber Resilience IV Wargame in support of US Indo-Pacific Command (USINDOPACOM).<br>- Completed Cyber Resiliency Assessment of key elements of the US Transportation Command (USTRANSCOM) Global Logistics Infrastructure.<br>- Initiated development of methods for cyber hardening legacy weapon systems and critical infrastructure.<br>- Advanced and matured tools and methodologies for conducting Deep Cyber Resiliency Assessments (DCRA).<br>- Assessed tools and capabilities for Enterprise Wide Application to Cyber Hardening Weapon Systems and Critical Infrastructure. Conducted assessment of commercial off-the-shelf Software Scrambling capabilities in collaboration with the National Security Agency.<br><br>Goal 3: Enhanced DIB Cybersecurity<br>- Initiated development of the Cybersecurity Maturity Model Certification (CMMC) and successfully rolled out the CMMC to industry. | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604771D8Z / *Joint Tactical Information Distribution System (JTIDS)* | **Project (Number/Name)**<br>105 / *Cyber Capability & Platform Resilience* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| - Initiated a range of DIB Cyber Security Pathfinders.<br>- Contributed to the establishment of a new A&S focus area on supply chain risk management (SCRM).<br>- Performed pilots for Supply Chain Illumination to enhance DIB security.<br><br>***FY 2020 Plans:***<br>Goal 1: Trained and Equipped Cyber Mission Force<br>- Advance and mature capabilities for conducting mission engineering for cyberspace operations.<br>- In coordination with USCYBERCOM, manage the components of the JCWA portfolio to enable the cyber mission force to efficiently and effectively conduct offensive and defensive cyber missions. Support offensive and defensive architecture development and portfolio management in collaboration with USCYBERCOM.<br>- As Principal Staff Assistant (PSA) Office of Primary Responsibility (OPR) for the Unified Platform (UP), oversee the Air Force's, as DoD Executive Agent (EA), capability development via portfolio management and governance. Assess UP's interfaces, dependencies, and linkages with other components of the JCWA to integrate and analyze data from offensive and defensive operations and enable effective and efficient offensive and defensive effects.<br>- Manage the portfolio of DoD cyber training systems; including the DoD Persistent Cyber Training Environment (PCTE), and govern the PCTE as a member of the PCTE governance boards.<br>- In support of Mission Engineering for Cyberspace Operations, continue to build the Cyber Mission Model (CMM) to include cyberspace tools and payloads. Directly inform JCWA decisions using Modeling and Simulation (M&S) tools.<br>- Continue to synchronize and govern the DoD Cyber Ranges that support Cyber Training and Testing and Evaluations as a member of the Cyber Ranges governance boards. Implement DoD Cyber Strategy by incorporating the cyber ranges reference architecture into the JCWA.<br><br>Goal 2: Cyber Hardened Weapon Systems and Critical Infrastructure<br>- Mature and enhance the OUSD(A&S) CISO Organization.<br>- Ensure Platform Resilience/Mission Assurance (PR/MA) in support of DoD Strategic Cybersecurity Program.<br>- Oversee implementation of the recommendations on cyber vulnerabilities of DoD weapon systems and tactical communications systems.<br>- Ensure execution of the evaluation of cyber vulnerabilities of DoD critical infrastructure plan.<br>- Stand up Mission Focused Cyber Hardening (MFCH) Teams to prioritize investments in mitigating cyber vulnerabilities to Defense Critical Missions.<br>- In support of MFCH Teams, develop a construct for measuring readiness of the kinetic force to operate in a contested cyber environment with the objective of enhancing CCMD understanding of Cyber Risk to Mission as a warfighting readiness issue.<br>- Enhance Cybersecurity Engineering for Major Defense Acquisition Programs.<br>- Conduct Cyber Resilience V assessment in support of USTRANSCOM. | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604771D8Z / *Joint Tactical Information Distribution System (JTIDS)* | **Project (Number/Name)**<br>105 / *Cyber Capability & Platform Resilience* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| - Initiate planning for Cyber Resilience VI assessment in support a CCMD to be identified.<br>- Conduct DCRA for the Positioning, Navigation, and Timing Enterprise.<br>- Advance Tools and Methodologies for assessing cyber risks to DoD missions and enhance knowledge repositories for storing and analyzing data from cyber vulnerability assessment and mitigation activities.<br>- Conduct kinetic and non-kinetic nodal analysis assessments (congressional add)<br>- Encrypted and authenticated data in transit analysis (congressional add)<br>***FY 2021 Plans:***<br>Goal 1: Trained and Equipped Cyber Mission Force<br>- Continue to advance and mature capabilities for conducting mission engineering for cyberspace operations.<br>- With USCYBERCOM, manage the portfolio of Joint Cyber Warfighting Architecture (JCWA) components to enable the cyber mission force to efficiently and effectively conduct offensive and defensive cyber missions. Support offensive and defensive architecture development and portfolio management in collaboration with USCYBERCOM.<br>- As PSA OPR for the UP, oversee the Air Force's, as DoD EA, capability development via portfolio management and governance. Assess UP's interfaces, dependencies, and linkages with other components of the JCWA to integrate and analyze data from offensive and defensive operations and enable effective and efficient offensive and defensive effects.<br>- Manage the portfolio of DoD cyber training systems; including the DoDs PCTE and govern the PCTE as a member of the PCTE governance boards.<br>- In support of Mission Engineering for Cyberspace Operations, continue to build CMM to include cyberspace tools and payloads. Directly inform JCWA decisions using M&S tools.<br>- Continue to synchronize and govern the DoD Cyber Ranges that support Cyber Training and Testing and Evaluations as a member of the Cyber Ranges governance boards. Implement DoD Cyber Strategy by incorporating the cyber ranges reference architecture into the JCWA.<br>- Advance Missions Analysis/Mission Engineering Capabilities for cyberspace operations through application of data science development of an operational level model for cyber warfare.<br><br>Goal 2: Cyber Hardened Weapon Systems and Critical Infrastructure<br>- Continue to mature and enhance the OUSD(A&S) CISO Organization<br>- Ensure PR/MA in support of the Strategic Cybersecurity Program<br>- Ensure execution of the evaluation of cyber vulnerabilities of DoD critical infrastructure plan.<br>- In support of CCMDs, assess the cyber risk to Defense Critical Missions through the conduct of cyber resiliency assessments.<br>- Reduce cyber risk to Defense Critical Missions through employment of Mission Focused Cyber Hardening Teams to prioritize and drive mitigations of critical cyber vulnerabilities. | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604771D8Z / *Joint Tactical Information Distribution System (JTIDS)* | **Project (Number/Name)**<br>105 / *Cyber Capability & Platform Resilience* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| - Advance Tools and Methodologies for conducting assessing cyber risks to DoD missions | | | |
| ***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>FY 2020 to FY 2021 increase is the result of planned program changes in OUSD(A&S). | | | |
| **Accomplishments/Planned Programs Subtotals** | 26.718 | 26.539 | 36.742 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Utilize existing fixed-price and cost-plus contracts (where appropriate) to continue developmental acquisition support and portfolio management in support of three primary Goals in support of the Department of Defense (DoD) Cyber Strategy

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 5 | R-1 Program Element (Number/Name)<br>PE 0604771D8Z / *Joint Tactical Information Distribution System (JTIDS)* | Project (Number/Name)<br>105 / *Cyber Capability & Platform Resilience* | |

**Support ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Contract awards | C/CPFF | OUSD OCISO (A) : Pentagon/Mark Center | 13.420 | 26.718 | Feb 2020 | 26.539 | | 36.742 | | - | | 36.742 | Continuing | Continuing | - |
| | | **Subtotal** | 13.420 | 26.718 | | 26.539 | | 36.742 | | - | | 36.742 | Continuing | Continuing | N/A |

**Remarks**

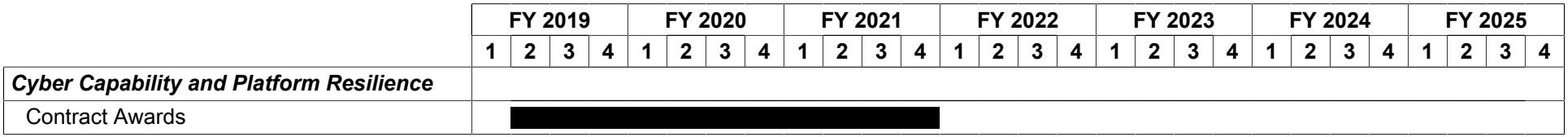
NA

| | Prior Years | FY 2019 | | FY 2020 | | FY 2021 Base | | FY 2021 OCO | | FY 2021 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | 13.420 | 26.718 | | 26.539 | | 36.742 | | - | | 36.742 | Continuing | Continuing | N/A |

**Remarks**

NA

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604771D8Z / *Joint Tactical Information Distribution System (JTIDS)* | **Project (Number/Name)**<br>105 / *Cyber Capability & Platform Resilience* |



| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604771D8Z / *Joint Tactical Information Distribution System (JTIDS)* | **Project (Number/Name)**<br>105 / *Cyber Capability & Platform Resilience* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***Cyber Capability and Platform Resilience*** | | | | |
| Contract Awards | 2 | 2019 | 4 | 2021 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 5 | R-1 Program Element (Number/Name)<br>PE 0604771D8Z / *Joint Tactical Information Distribution System (JTIDS)* | Project (Number/Name)<br>028 / *Cybersecurity: Cybersecurity Maturity Model Certification (CMMC) and Pathfinders* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 028: *Cybersecurity: Cybersecurity Maturity Model Certification (CMMC) and Pathfinders* | 0.000 | 0.000 | 15.000 | 12.978 | - | 12.978 | 3.000 | 3.000 | 3.000 | 3.000 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

Develop Cybersecurity Maturity Model Certification (CMMC) framework that incorporates multiple cybersecurity standards and references into a unified standard that encompasses both the progression of capabilities and controls as well as the institutionalization of processes to secure Controlled Unclassified Information (CUI) within the Defense Industrial Base (DIB) sector. Conduct pathfinders and implement 3rd party regulator and CMMC assessment organizations under a governance structure.

Conduct pathfinders to assess the feasibility and efficacy of employing emerging commercial services/tools/platforms that provide insights into cybersecurity threats and vulnerabilities that are relevant to the DIB sector and the DoD supply chain.

Partner with the DIB sector to demonstrate cost-effective and scalable cybersecurity services that augment and/or enhance existing commercial capabilities and services. Focus on cybersecurity services for small-to-medium sized DIB companies that are critical to the DoD supply chain but lack sufficient cybersecurity capabilities to protect CUI.

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| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** DIB Secure Cloud Managed Services Pilot | - | 15.000 | 12.978 |
| ***FY 2020 Plans:***<br>Develop CMMC framework, conduct related CMMC pathfinders and assessments of select DIB members, and plan for the needed infrastructure (tools, platforms, databases, etc.) to support the requirements for the 3rd party assessments and certifications.<br><br>Conduct pathfinders to assess the feasibility and efficacy of employing emerging commercial services/tools/platforms that provide insights into cybersecurity threats and vulnerabilities that are relevant to the DIB sector and the DoD supply chain. Analyze data from pathfinders to inform the way forward.<br><br>Partner with the DIB sector to develop and demonstrate cost-effective and scalable cybersecurity services that augment and/or enhance existing commercial capabilities and services. | | | |
| ***FY 2021 Plans:*** | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604771D8Z / *Joint Tactical Information Distribution System (JTIDS)* | **Project (Number/Name)**<br>028 / *Cybersecurity: Cybersecurity Maturity Model Certification (CMMC) and Pathfinders* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Update and refine CMMC framework based on cyber threats and pathfinding outputs. Continue implementation of CMMC to a broader set of DoD contracts and in turn, the DIB sector. Continue to mature associated CMMC infrastructure.<br><br>Mature and expand the deployment of services/tools/platforms that provide insights into cybersecurity threats and vulnerabilities that are relevant to the DIB sector and the DoD supply chain.<br><br>Update and transition cost-effective and scalable cybersecurity services and best practices to commercial sector for broader deployment to the small-to-medium sized companies in the DIB sector<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>FY 2020 to FY 2021 decrease is the result of planned program changes in OUSD(A&S). | | | |
| **Accomplishments/Planned Programs Subtotals** | - | 15.000 | 12.978 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 5 | R-1 Program Element (Number/Name)<br>PE 0604771D8Z / *Joint Tactical Information Distribution System (JTIDS)* | Project (Number/Name)<br>028 / *Cybersecurity: Cybersecurity Maturity Model Certification (CMMC) and Pathfinders* | |

**Management Services ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Management Services/ Support | C/Various | OUSD OCISO (A) : Pentagon/Mark Center | - | - | | 15.000 | | 12.978 | | - | | 12.978 | Continuing | Continuing | - |
| | | **Subtotal** | - | - | | 15.000 | | 12.978 | | - | | 12.978 | Continuing | Continuing | N/A |

| | Prior Years | FY 2019 | | FY 2020 | | FY 2021 Base | | FY 2021 OCO | | FY 2021 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | - | - | | 15.000 | | 12.978 | | - | | 12.978 | Continuing | Continuing | N/A |

**Remarks**

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604771D8Z / *Joint Tactical Information Distribution System (JTIDS)* | **Project (Number/Name)**<br>028 / *Cybersecurity: Cybersecurity Maturity Model Certification (CMMC) and Pathfinders* |

| | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | | FY 2025 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| ***DIB Secure Managed Services Pilot*** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cybersecurity: Cybersecurity Maturity Model Certification (CMMC) and Pathfinders | | | | | [redacted] | | | | | | | | | | | | | | | | | | | | | | | |

| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604771D8Z / *Joint Tactical Information Distribution System (JTIDS)* | **Project (Number/Name)**<br>028 / *Cybersecurity: Cybersecurity Maturity Model Certification (CMMC) and Pathfinders* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***DIB Secure Managed Services Pilot*** | | | | |
| Cybersecurity: Cybersecurity Maturity Model Certification (CMMC) and Pathfinders | 4 | 2019 | 3 | 2021 |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 5: *System Development & Demonstration (SDD)* | **R-1 Program Element (Number/Name)**<br>PE 0605022D8Z / *Defense Exportability Features (DEF) Program* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 16.323 | 1.455 | 12.115 | 12.928 | - | 12.928 | 10.648 | 10.562 | 19.106 | 19.477 | Continuing | Continuing |
| 013: *Defense Exportability Features (DEF) Program* | 16.323 | 1.455 | 12.115 | 12.928 | - | 12.928 | 10.648 | 10.562 | 19.106 | 19.477 | Continuing | Continuing |

**Note**

The funding request for the Defense Exportability Features (DEF) Program for FY 2020 - 2025 reflects new, higher demand for funds as the Department of Defense (DoD) increasingly makes integration of exportability features a standard part of the DoD's requirements development and defense acquisition system. As reflected in the new guidance in the Joint Requirements Oversight Council Memorandum (JROCM) 025-19 signed by the Vice Chairman of the Joint Chiefs of Staff (VCJCS) on April 15, 2019, DoD will update the Joint Capabilities Integration and Development System (JCIDS) Manual to make it standard practice to include the requirements for exportability in a system's capability requirements documents

**A. Mission Description and Budget Item Justification**

The DEF program funds activities to support identification of major defense acquisition programs for possible export and the planning for design and incorporation of exportability features during the research and development phases of these programs. Features include, but are not limited to, technology and engineering design activities such as capability differentials, anti-tamper, system assurance, and software assurance. Activities include the development of program protection strategies for the program; the design and incorporation of exportability features into the system; implementation of exportability requirements into contracts; and other research, development, test, and evaluation activities.

Defense exportability features play a critically important role in DoD efforts to build partnership capacity. Funds support building joint and coalition environments by enabling the export of DoD systems to a wide range of partner nations, resulting in improved security and interoperability. In addition to the operational benefits, by providing these resources up front, the United States and partner nations will save significant resources by more efficiently designing and producing exportable U.S. systems.

Experience has shown that failure to identify the full range of Critical Program Information (CPI) early in a DoD program's design phase can drive major affordability and schedule problems later when programs have to "retrofit" program protection measures prior to export. Early development of export variants, including systems design approaches to integrate exportable anti-tamper protection and differential capability requirements to lower production costs, makes it possible to improve quality and timely deliveries to allies and friends and may enhance US industry share of the global marketplace.

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 5: *System Development & Demonstration (SDD)* | **R-1 Program Element (Number/Name)**<br>PE 0605022D8Z *I Defense Exportability Features (DEF) Program* |

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 1.489 | 17.615 | 14.445 | - | 14.445 |
| Current President's Budget | 1.455 | 12.115 | 12.928 | - | 12.928 |
| Total Adjustments | -0.034 | -5.500 | -1.517 | - | -1.517 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | -0.031 | - | | | |
| • FFRDC | -0.003 | - | - | - | - |
| • Congresssional Reduction | - | -5.500 | - | - | - |
| • Other Program Adjustments | - | - | -0.751 | - | -0.751 |
| • Defense Wide Review | - | - | -0.766 | - | -0.766 |

**Change Summary Explanation**

The FY 2021 funding request was reduced by $0.766 million as a result of the Defense Wide Review, which focused on the Secretary's guidance to streamline operations, increase efficiency, and promote greater affordability within the OSD and Defense Agencies and Field Activities in order to ensure the Department's optimum alignment to the National Defense Strategy and DoD strategic guidance, with particular focus on building a more lethal, resilient, agile, and ready force while strengthening alliances, prioritizing cyber and space capabilities, and focusing on innovation to maintain the technological advantage."

An additional $0.751 million dollars was re-aligned to support planned program changes within the Office of the Under Secretary of Defense Acquisition and Sustainment OUSD(A&S).

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 5 | R-1 Program Element (Number/Name)<br>PE 0605022D8Z / *Defense Exportability Features (DEF) Program* | Project (Number/Name)<br>013 / *Defense Exportability Features (DEF) Program* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 013: *Defense Exportability Features (DEF) Program* | 16.323 | 1.455 | 12.115 | 12.928 | - | 12.928 | 10.648 | 10.562 | 19.106 | 19.477 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

The DEF program funds activities to support identification of major defense acquisition programs for possible export and the planning for design and incorporation of exportability features during the research and development phases of these programs. Features include, but are not limited to, technology and engineering design activities such as capability differentials, anti-tamper, system assurance, and software assurance. Activities include the development of program protection strategies for the program; the design and incorporation of exportability features into the system; implementation of exportability requirements into contracts; and other research, development, test, and evaluation activities.

Defense exportability features play a critically important role in DoD efforts to build partnership capacity. Funds support building joint and coalition environments by enabling the export of DoD systems to a wide range of partner nations, resulting in improved security and interoperability. In addition to the operational benefits, by providing these resources up front, the United States and partner nations will save significant resources by more efficiently designing and producing exportable U.S. systems.

Failure to consider export variant designs early in the acquisition process results in increased costs, delayed delivery, and higher risk of sensitive technology compromise. Early development of export variants, including systems design approaches to integrate exportable anti-tamper protection and differential capability requirements to lower production costs, makes it possible to improve quality and timely deliveries to allies and friends and may enhance US industry share of the global marketplace.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** DEF program | 1.455 | 12.115 | 12.928 |
| ***Description:*** The DEF program enables DoD programs to develop and incorporate technology protection features in designated systems during the research and development phase of such systems to prepare them for export. By facilitating the export of US defense systems, the DoD enhances the US defense industrial base, strengthens the military capabilities of US allies around the world, and increases coalition interoperability. | | | |
| ***FY 2020 Plans:*** | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0605022D8Z / *Defense Exportability Features (DEF) Program* | **Project (Number/Name)**<br>013 / *Defense Exportability Features (DEF) Program* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Provide follow-on funding to the Army's Lower Tier Air and Missile Defense Sensor (LTAMDS) and Indirect Fire Protection Capability (IFPC) Inc. programs to continue exportability planning activities. Provide initial funding to programs that have been selected to the DEF Program during the FY 2020 nomination cycle.<br>***FY 2021 Plans:***<br>Provide funding to help DoD programs plan for exportability in line with recent changes to DoD guidance, such as the Joint Requirements Oversight Council Memorandum (JROCM) signed by the Vice Chairman of the Joint Chiefs of Staff (VCJCS) on April 15, 2019, that make exportability planning the rule. In particular, support several modernization priority programs to plan for exportability to allies and partners.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The increase of $0.813 million between FY 2020 and FY 2021 is the result of planned program changes in OUSD(A&S). | | | |
| **Accomplishments/Planned Programs Subtotals** | 1.455 | 12.115 | 12.928 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0605022D8Z / *Defense Exportability Features (DEF) Program* | **Project (Number/Name)**<br>013 / *Defense Exportability Features (DEF) Program* |

**Product Development ($ in Millions)**

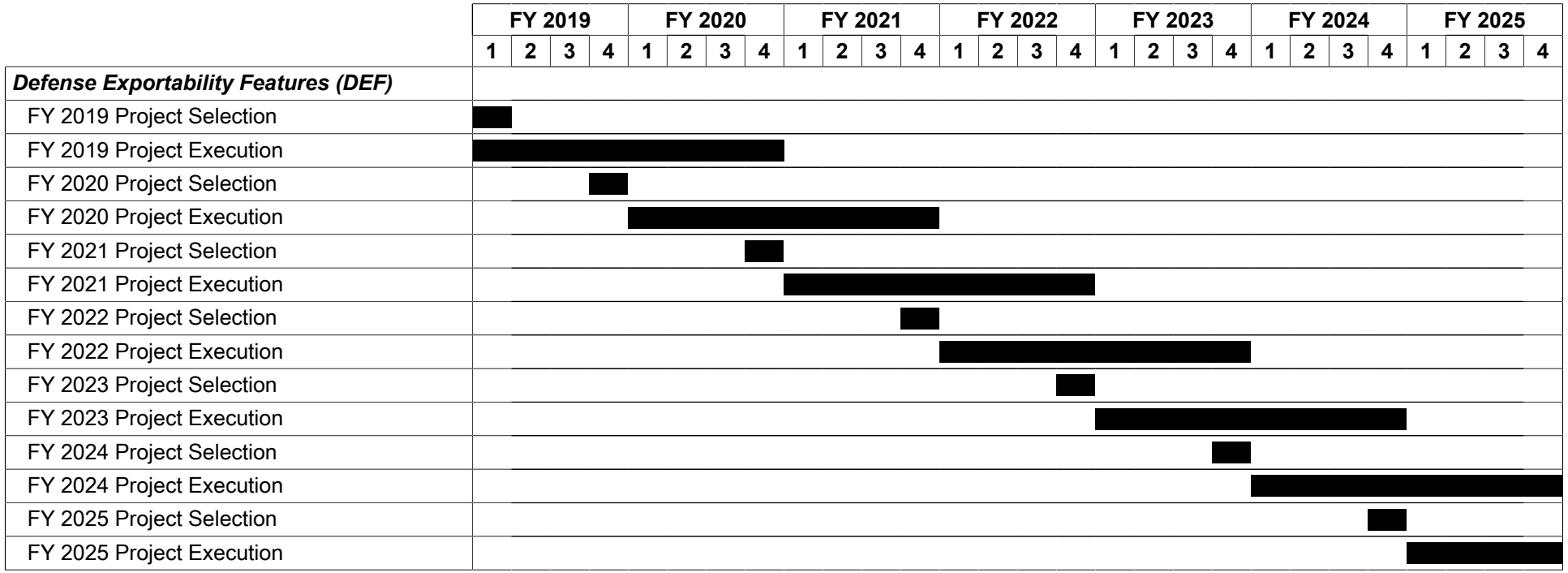
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DEF | TBD | Various : Various | 16.323 | 1.455 | | 12.115 | | 12.928 | | - | | 12.928 | Continuing | Continuing | - |
| | | **Subtotal** | 16.323 | 1.455 | | 12.115 | | 12.928 | | - | | 12.928 | Continuing | Continuing | N/A |

| | Prior Years | FY 2019 | | FY 2020 | | FY 2021 Base | | FY 2021 OCO | | FY 2021 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | 16.323 | 1.455 | | 12.115 | | 12.928 | | - | | 12.928 | Continuing | Continuing | N/A |

**Remarks**

The funding request for the Defense Exportability Features (DEF) Program for FY 2020 - FY 2025 reflects new, higher demand for funds as the Department of Defense (DoD) increasingly makes integration of exportability features a standard part of the DoD's requirements development and defense acquisition system. As reflected in the new guidance in the Joint Requirements Oversight Council Memorandum (JROCM) 025-19 signed by the Vice Chairman of the Joint Chiefs of Staff (VCJCS) on April 15, 2019, DoD will update the Joint Capabilities Integration and Development System (JCIDS) Manual to make it standard practice to include the requirements for exportability in a system's capability requirements documents

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0605022D8Z / *Defense Exportability Features (DEF) Program* | **Project (Number/Name)**<br>013 / *Defense Exportability Features (DEF) Program* |



| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0605022D8Z / *Defense Exportability Features (DEF) Program* | **Project (Number/Name)**<br>013 / *Defense Exportability Features (DEF) Program* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***Defense Exportability Features (DEF)*** | | | | |
| FY 2019 Project Selection | 1 | 2019 | 1 | 2019 |
| FY 2019 Project Execution | 1 | 2019 | 4 | 2020 |
| FY 2020 Project Selection | 4 | 2019 | 4 | 2019 |
| FY 2020 Project Execution | 1 | 2020 | 4 | 2021 |
| FY 2021 Project Selection | 4 | 2020 | 4 | 2020 |
| FY 2021 Project Execution | 1 | 2021 | 4 | 2022 |
| FY 2022 Project Selection | 4 | 2021 | 4 | 2021 |
| FY 2022 Project Execution | 1 | 2022 | 4 | 2023 |
| FY 2023 Project Selection | 4 | 2022 | 4 | 2022 |
| FY 2023 Project Execution | 1 | 2023 | 4 | 2024 |
| FY 2024 Project Selection | 4 | 2023 | 4 | 2023 |
| FY 2024 Project Execution | 1 | 2024 | 4 | 2025 |
| FY 2025 Project Selection | 4 | 2024 | 4 | 2024 |
| FY 2025 Project Execution | 1 | 2025 | 4 | 2025 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 5: *System Development & Demonstration (SDD)* | **R-1 Program Element (Number/Name)**<br>PE 0605027D8Z / *OUSD(C) IT Development Initiative* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 77.446 | 9.219 | 9.590 | 10.259 | 0.000 | 10.259 | 10.592 | 10.912 | 11.341 | 11.653 | Continuing | Continuing |
| 927: *Next Generation Resource Management System* | 39.984 | 1.219 | 4.983 | 4.221 | 0.000 | 4.221 | 4.346 | 4.487 | 4.695 | 4.871 | Continuing | Continuing |
| 930: *Defense Repository for Common Enterprise Data* | 37.462 | 8.000 | 4.607 | 6.038 | 0.000 | 6.038 | 6.246 | 6.425 | 6.646 | 6.782 | Continuing | Continuing |

**Note**

BUDGET REQUEST JUSTIFICATION: +$10.259 million is required to support the following efforts:

+$4.221 million is required to support Next Generation Resource Management Systems.

+$6.038 million is required to support Defense Repository for Common Enterprise Data (Advana)

**A. Mission Description and Budget Item Justification**

As the Department of Defense strategic, operational, and tactical plans and objectives transform the war fighter with new capabilities and doctrine, the budgeting and accountability of funds used to pursue the Department objectives will become more complicated and detailed for senior leaders to make decisions with supporting rationale for the taxpayer. Incorporating information technology toward current and emerging business processes manifesting into a state-of-the art system of systems will result in increasing efficiencies, timely diagnostics, and reducing lifecycle costs to maintain, sustain and repair.

This initiative exploits emerging technology, processes, trends, capabilities, and techniques to incorporate state-of-the-art information technology enabling the ability, agility, and level of fidelity to collect, process, administrate and report resource management data and to automate business processes within a more robust analytical environment within the Office of the Under Secretary of Defense (Comptroller) OUSD(C).

NEXT GENERATION RESOURCE MANAGEMENT SYSTEM:

The Office of the Under Secretary of Defense (Comptroller) (OUSD(C)) is responsible for advising the Secretary of Defense on all Defense budgetary and fiscal matters, for Defense budget development and execution, and for overseeing financial management across the Department. The OUSD(C) has a broad set of responsibilities in supporting the Planning, Programing, Budget and Execution (PPBE) process. The Office of the Director, Cost Assessment and Program Evaluation (CAPE), provides independent analytic advice to the Secretary of Defense on all aspects of the Defense program, including alternative weapon systems and force structures, the development and evaluation of program and defense program alternatives, and the cost-effectiveness of defense systems. There is a critical need for the development of a state-of-the-art information technology system to modernize and replace multiple, antiquated legacy systems and processes used to formulate, justify, present and defend the entire Department of Defense Budget in the Office of the Under Secretary of Defense (Comptroller (OUSD(C)) to meet Title 10 and Title 31 mission and

reporting requirements. The Comptroller's plan for mitigating the deficiencies and capability gaps associated with current systems is development of the Next Generation Resource Management System.

OUSD(C) and CAPE use multiple systems to formulate, justify, distribute, and execute DoD budgets. The information managed by the budget formulation and programming systems is redundant, and reconciliation of information is difficult and inefficient. These systems require extensive manpower investments to give executives the information they need to make key financial decisions in a timely manner.

The OUSD(C) and CAPE require a more efficient, effective Defense budget environment that optimizes the budget cycle to ensure users are processing and reporting efficiently and DoD Senior Leadership has the information to make informed, critical decisions.

The OUSD(C) requires capabilities that shall provide for the effective formulation, and justification of the Defense budget. The requirement is for:
• Automated exchange and reconciliation of budget data
• Improved efficiency through the utilization of a unified budgetary model
• Instantaneous ability to generate data for management reviews and decisions
• Capability to accommodate emerging business practices

Moving forward, the new "to be" system shall be designed as a single system with a unified data source for OUSD(C) and CAPE. The new system shall provide a single, integrated system that employs the latest technologies to fulfill the Department's financial management responsibilities in an effective and efficient manner. The new system shall provide twenty-first century information technology that shall allow users to view information from multiple fully integrated modules simultaneously, e.g., current year budget submission, decision documents from previous years, and budget execution information.

DEFENSE REPOSITORY FOR COMMON ENTERPRISE DATA:

Defense Repository for Common Enterprise data (Advana) support financial audit, cost management, performance management, and readiness.

The DoD Advana requires:
• All supporting Department data that rolls up to the DoD financial statement (detailed accounting data reconciled to the financial statement)
• Proof of the completeness of all transactional data reported within the UoT (detailed accounting data reconciled to business events)
• Ability to extract subset populations
• Ability to secure and protect the data within the UoT

The failure to meet these requirements will result in the Department unable to successfully conduct and pass an audit.

To achieve these requirements, the Office of the Under Secretary of Defense (Comptroller) is creating a tool called the Defense Repository for Common Enterprise Data (Advana). This tool has the potential to significantly improve DoD's capability and capacity to handle large volumes of standard and non-standard business and

readiness data. Both an application and analytical platform, the Advana leverages an open-source software framework for storing data and running applications to deliver a complete Advana.

The first phase of Advana implementation is a proof of concept with the U.S. Special Operations Command (USSOCOM) systems to develop a baseline application and configuration. When the first phase has been successfully completed, the second phase will integrate into the full solution any remaining accounting and business feeder systems that execute TI-97 funds and be the solution for DATA Act. The proof of concept was successful and the program moved to an operations phase in FY18.

DRCED is a joint effort between Office of the Deputy Chief Financial Officer (ODCFO), Office of the Chief Management Officer (ODCMO), Office of the Chief Information Officer (OCIO), USSOCOM, and the Defense Finance and Accounting Service (DFAS).

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 9.568 | 15.653 | 14.274 | - | 14.274 |
| Current President's Budget | 9.219 | 9.590 | 10.259 | - | 10.259 |
| Total Adjustments | -0.349 | -6.063 | -4.015 | - | -4.015 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | -6.063 | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | -0.349 | - | | | |
| • Realignment | - | - | -1.500 | - | -1.500 |
| • Other Adjustment | - | - | -0.103 | - | -0.103 |
| • Economic Assumptions Reduction | - | - | -0.012 | - | -0.012 |
| • Defense Wide Review Reduction | - | - | -2.400 | - | -2.400 |

**Change Summary Explanation**

FY 2021 BUDGET REQUEST JUSTIFICATION: +$4.221 million is required to support Next Generation Resource Management System (NGRMS).and $6.038 million is required to support Defense Repository for Common Enterprise Data.

The FY2021 funding request was reduced by $2.400 million during the Defense Wide Review to account for implementing efficiencies in the acquisition strategy for NGRMS.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 5 | R-1 Program Element (Number/Name)<br>PE 0605027D8Z / *OUSD(C) IT Development Initiative* | Project (Number/Name)<br>927 / *Next Generation Resource Management System* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 927: *Next Generation Resource Management System* | 39.984 | 1.219 | 4.983 | 4.221 | 0.000 | 4.221 | 4.346 | 4.487 | 4.695 | 4.871 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**Note**

Realignment of $1.5M to PE: 0903388D8Z

**A. Mission Description and Budget Item Justification**

The Office of the Under Secretary of Defense (Comptroller) (OUSD(C)) is responsible for advising the Secretary of Defense on all Defense budgetary and fiscal matters, for Defense budget development and execution, and for overseeing financial management across the Department. The OUSD(C) has a broad set of responsibilities in supporting the Planning, Programing, Budget and Execution (PPBE) process. The Office of the Director, Cost Assessment and Program Evaluation (CAPE), provides independent analytic advice to the Secretary of Defense on all aspects of the Defense program, including alternative weapon systems and force structures, the development and evaluation of programs and defense program alternatives, and the cost-effectiveness of defense systems.

OUSD(C) and CAPE use multiple systems to formulate, justify, distribute, and execute DoD budgets. The information managed by the budget formulation and programming systems is redundant, and reconciliation of information is difficult and inefficient. These systems require extensive manpower investments to give executives the information they need to make key financial decisions in a timely manner.

The OUSD(C) and CAPE require a more efficient, effective Defense budget environment that optimizes the budget cycle to ensure users are processing and reporting efficiently and DoD Senior Leadership has the information to make informed, critical decisions.

The OUSD(C) requires capabilities that shall provide for the effective formulation, and justification of the Defense budget. The requirement is for:
- Automated exchange and reconciliation of budget data
- Improved efficiency through the utilization of a unified budgetary model
- Instantaneous ability to generate data for management reviews and decisions
- Capability to accommodate emerging business practices

Moving forward, the new “to be” system shall be designed as a single system with a unified data source for OUSD(C) and CAPE. The new system shall provide a single, integrated system that employs the latest technologies to fulfill the Department’s financial management responsibilities in an effective and efficient manner. The new system shall provide twenty-first century information technology that shall allow users to view information from multiple fully integrated modules simultaneously, e.g., current year budget submission, decision documents from previous years, and budget execution information.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0605027D8Z / *OUSD(C) IT Development Initiative* | **Project (Number/Name)**<br>927 / *Next Generation Resource Management System* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Next Generation Resource Management System | 1.219 | 4.983 | 4.221 |
| ***Description:*** Plan, develop, test and evaluate the system components (i.e. unified database, expert system, cross domain security, enterprise service bus, applications, services) and supportability requirements in modernizing the budget formulation, programming execution and reporting capabilities for the Department of Defense. Activities will include, but not be limited to, the preparation of all documentation required for Clinger-Cohen Compliance and acquisition regulations, developing requests for proposals, and oversight and management of contracts and deliverables.<br><br>***FY 2020 Plans:***<br>FY 2020 planned development will include the development of a Single Submission prototype with the results used to structure the design, development, testing and deployment of future NGRMS increments. FY 2020 plans also include the milCloud build of the Development, Production, and COOP environments for NGRMS.<br><br>***FY 2021 Plans:***<br>FY 2021 planned development will include the development, developmental and operational test, and deployment of the production interfaces. Development and developmental test of the reporting/analytic tool will start in FY 2021.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Decrease is due to $1.500 million realignment to O&M to fund the sustainment of the NGRMS milCloud environments and single submission capability. | | | |
| **Accomplishments/Planned Programs Subtotals** | 1.219 | 4.983 | 4.221 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Agile development on a smaller scale to replace legacy mission subsystems capabilities.

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 5 | R-1 Program Element (Number/Name)<br>PE 0605027D8Z / *OUSD(C) IT Development Initiative* | Project (Number/Name)<br>927 / *Next Generation Resource Management System* | |

**Product Development ($ in Millions)**

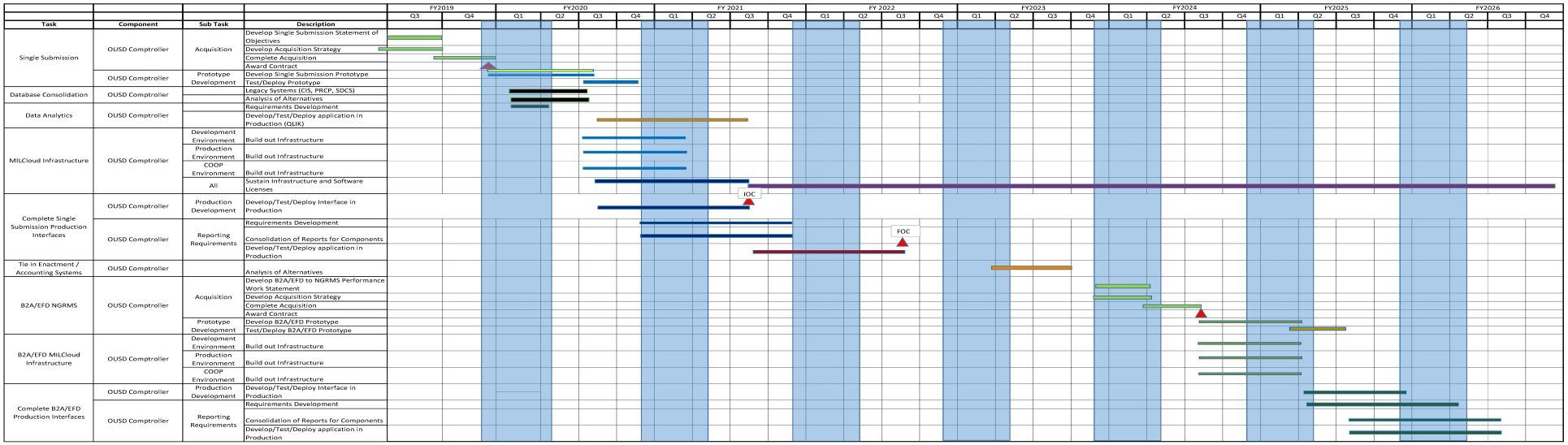
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Development | C/TBD | OUSD(C) : Pentagon & Contractor Off-site Facility | 39.984 | 1.219 | Feb 2020 | 4.983 | Dec 2020 | 4.221 | | - | | 4.221 | Continuing | Continuing | - |
| | | **Subtotal** | 39.984 | 1.219 | | 4.983 | | 4.221 | | - | | 4.221 | Continuing | Continuing | N/A |

| | Prior Years | FY 2019 | | FY 2020 | | FY 2021 Base | | FY 2021 OCO | | FY 2021 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | 39.984 | 1.219 | | 4.983 | | 4.221 | | - | | 4.221 | Continuing | Continuing | N/A |

**Remarks**

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0605027D8Z / *OUSD(C) IT Development Initiative* | **Project (Number/Name)**<br>927 / *Next Generation Resource Management System* |

NGRMS PROJECT PLAN



| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0605027D8Z / *OUSD(C) IT Development Initiative* | **Project (Number/Name)**<br>927 / *Next Generation Resource Management System* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***NGRMS*** | | | | |
| Single Submission | 3 | 2018 | 4 | 2020 |
| Database Consolidation | 1 | 2020 | 3 | 2020 |
| Data Analytics | 1 | 2020 | 3 | 2021 |
| MilCloud Infrastructure | 3 | 2020 | 3 | 2021 |
| Complete Single Submission Product Interfaces | 3 | 2020 | 3 | 2022 |
| Tie in Enactment/Accounting System | 1 | 2023 | 4 | 2023 |
| B2A/EFD NGRMS | 4 | 2023 | 3 | 2025 |
| B2A/EFD MILCloud Infrastructure | 3 | 2024 | 1 | 2025 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 5 | R-1 Program Element (Number/Name)<br>PE 0605027D8Z / *OUSD(C) IT Development Initiative* | Project (Number/Name)<br>930 / *Defense Repository for Common Enterprise Data* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 930: *Defense Repository for Common Enterprise Data* | 37.462 | 8.000 | 4.607 | 6.038 | 0.000 | 6.038 | 6.246 | 6.425 | 6.646 | 6.782 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**Note**

+$6.038 million is required to support Defense Repository for Common Enterprise Data (Advana).

**A. Mission Description and Budget Item Justification**

Without a single Defense Repository for Common Enterprise Data (Advana) to support the TI97 General Fund for the 4th Estate the Department will be incapable of asserting readiness for an independent audit of the
consolidated financial statements. All DoD organizations are pursuing the current statutory goal of achieving the state of audit that supports entry into a full financial statement of audit in FY 2018 with an initial opinion rendered in mid-FY 2019. Without an automated capability to provide a transactional universe for sampling and evidentiary proof the department will not be in compliance with public law.

The requested funds will be used to buy “Big Data” software and hardware infrastructure and required contractor services to implement the technology to meet the UoT requirement. These funds also include subject matter expertise costs for DCFO and funds to be placed on a contract for hardware, software, and labor. This will not result in hiring additional government personnel.

The Defense Repository for Common Enterprise Data (Advana) will have the capability to:
• Ingest data from multiple accounting and financial feeder systems
• Normalize data from multiple sources providing a common data architecture
• Reconcile transactional details to summary financial data
• Provide auditor’s the ability to sample TI-97 detailed transactions
• Business Analytics/Reporting
• DATA Act which is a statutory requirement to be completed by May 2017
• Provide NIPR and SIPR capability for non-sensitive and sensitive data

This effort will expand in scope to support other enterprise analytics efforts like cost management, performance management, and readiness. The scope is to bring in data from an estimated 50 systems and demonstrate existence and completeness of business and accounting transaction data, which are capabilities required for audit readiness and other analytical use cases.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Defense Repository for Common Enterprise Data (Advana) | 8.000 | 4.607 | 6.038 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0605027D8Z / *OUSD(C) IT Development Initiative* | **Project (Number/Name)**<br>930 / *Defense Repository for Common Enterprise Data* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Description:*** Plan, develop, test and evaluate the system components (i.e. unified database, cross domain security, applications, services) and supportability requirements in creating a universe of transactions for the Defense Wide General Fund Appropriation financial audit, cost management, performance management, and readiness.<br><br>The funds will be used to support increments eleven, twelve, and thirteen per the schedule.<br><br>***FY 2020 Plans:***<br>FY20 continues the development of a Defense Repository for Common Enterprise Data (Advana) to aggregate and fuse multiple data sources to make business and analytical decisions, find data inconsistencies and improve financial audits across the DoD.<br><br>***FY 2021 Plans:***<br>FY21 continues the development of a Defense Repository for Common Enterprise Data(Advana) to accelerate analytics, improve user success and Advana adoption, provide a stable and robust infrastructure across the DoD.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Continues the development of a Defense Repository for Common Enterprise Data(Advana) to accelerate analytics, improve user success and Advana adoption, provide a stable and robust infrastructure across the DoD. | | | |
| **Accomplishments/Planned Programs Subtotals** | 8.000 | 4.607 | 6.038 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Leveraging existing contracts to continue development.

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0605027D8Z / *OUSD(C) IT Development Initiative* | **Project (Number/Name)**<br>930 / *Defense Repository for Common Enterprise Data* |

**Product Development ($ in Millions)**

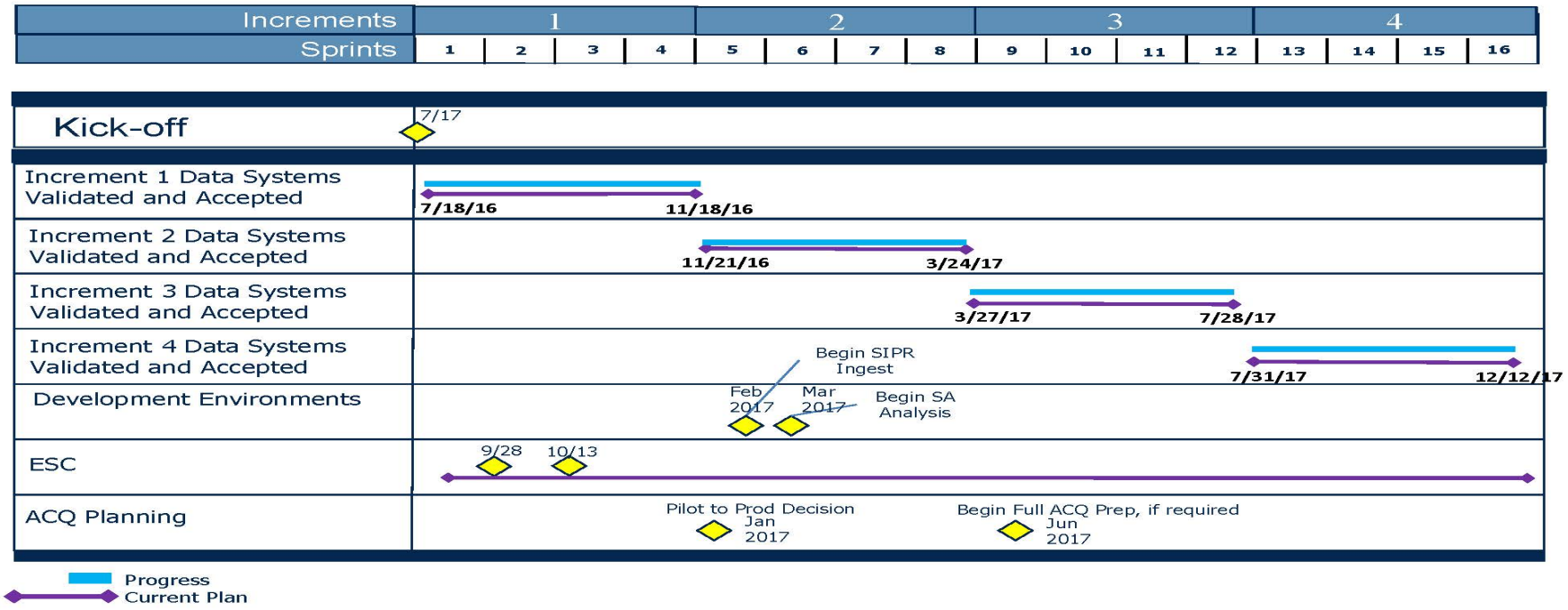
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Development | C/TBD | OUSD(C) : Pentagon | 37.462 | 8.000 | May 2019 | 4.607 | Aug 2019 | 6.038 | Aug 2021 | 0.000 | | 6.038 | Continuing | Continuing | - |
| | | **Subtotal** | 37.462 | 8.000 | | 4.607 | | 6.038 | | 0.000 | | 6.038 | Continuing | Continuing | N/A |

| | Prior Years | FY 2019 | | FY 2020 | | FY 2021 Base | | FY 2021 OCO | | FY 2021 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | 37.462 | 8.000 | | 4.607 | | 6.038 | | 0.000 | | 6.038 | Continuing | Continuing | N/A |

**Remarks**

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0605027D8Z / *OUSD(C) IT Development Initiative* | **Project (Number/Name)**<br>930 / *Defense Repository for Common Enterprise Data* |

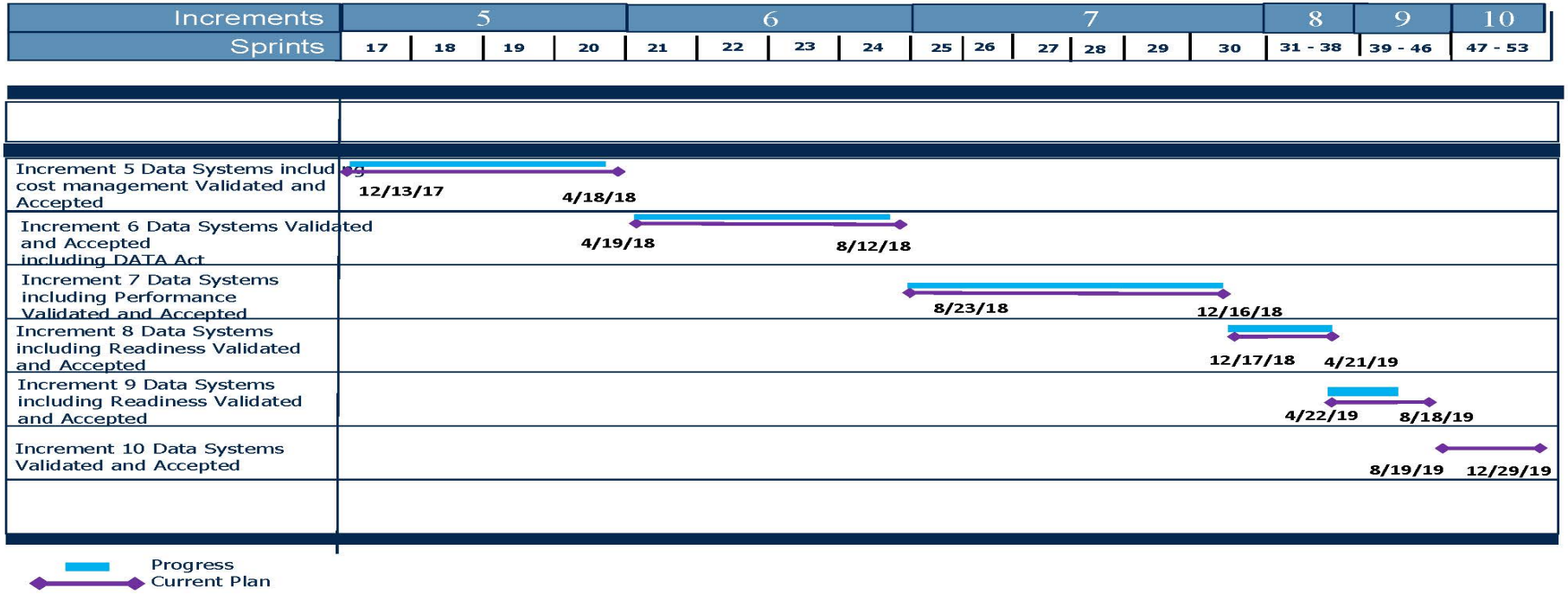
# ADVANA Schedule Overview




Slide: 1

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0605027D8Z / *OUSD(C) IT Development Initiative* | **Project (Number/Name)**<br>930 / *Defense Repository for Common Enterprise Data* |

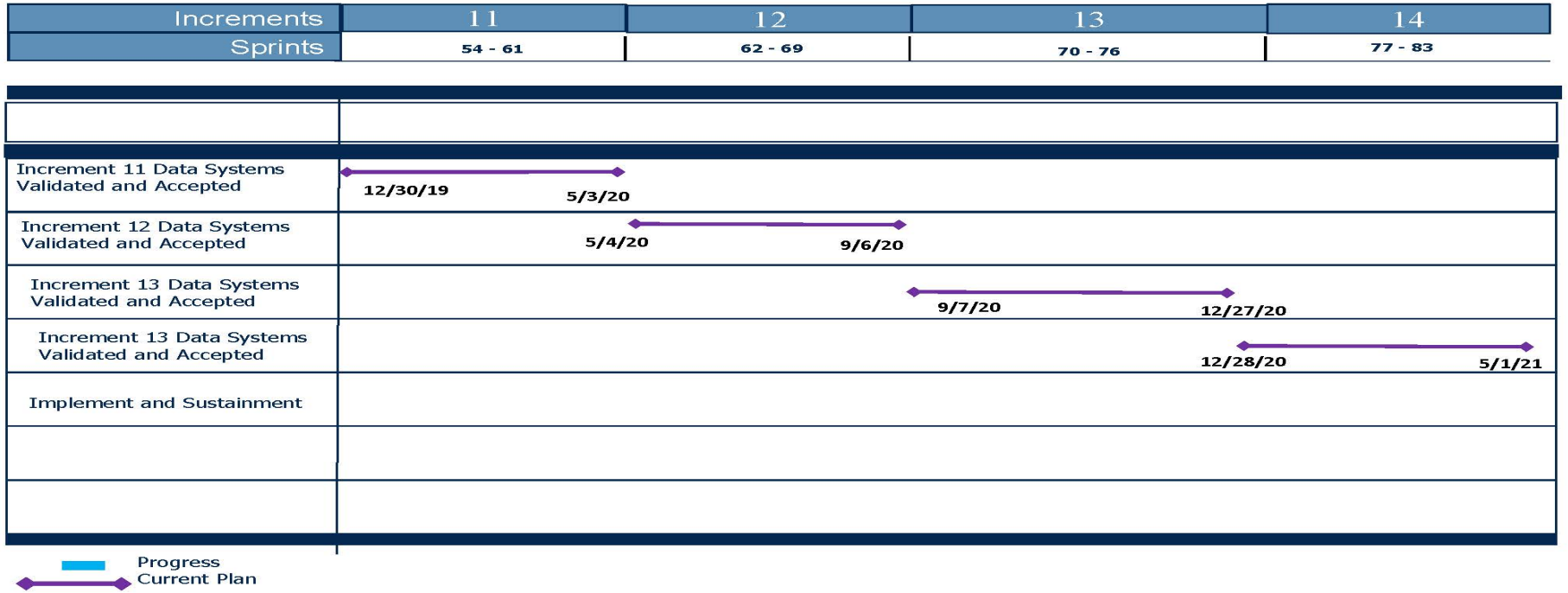
# ADVANA Schedule Overview Cont.




Slide: 2

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0605027D8Z / *OUSD(C) IT Development Initiative* | **Project (Number/Name)**<br>930 / *Defense Repository for Common Enterprise Data* |

# ADVANA Schedule Overview Cont.




Slide: 3

| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0605027D8Z / *OUSD(C) IT Development Initiative* | **Project (Number/Name)**<br>930 / *Defense Repository for Common Enterprise Data* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***Acquisiiton Milestone*** | | | | |
| Development and ingest further data | 4 | 2019 | 4 | 2025 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 5: *System Development & Demonstration (SDD)* | **R-1 Program Element (Number/Name)**<br>PE 0605075D8Z / *CMO Policy and Integration* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 93.045 | 2.100 | 1.618 | 1.648 | - | 1.648 | 1.675 | 1.705 | 1.741 | 1.776 | Continuing | Continuing |
| 075: *CMO Policy and Integration* | 93.045 | 2.100 | 1.618 | 1.648 | - | 1.648 | 1.675 | 1.705 | 1.741 | 1.776 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

To produce and sustain a Business Enterprise Architecture (BEA) to guide business transformation and business system investment actions for the DoD. The requirement to produce and maintain a BEA is codified in NDAA 2012, USC Title 10, Section 2222 with amplifying guidance from OMB. The proposed program provides improved capabilities to access and use the BEA information including descriptions of business processes and associated information assets; required capabilities and associated performance requirements; and governing laws, regulations and policies (LRPs).

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 2.100 | 1.618 | 1.650 | - | 1.650 |
| Current President's Budget | 2.100 | 1.618 | 1.648 | - | 1.648 |
| Total Adjustments | 0.000 | 0.000 | -0.002 | - | -0.002 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | - | - | | | |
| • Economic Assumptions | - | - | -0.002 | - | -0.002 |

**Change Summary Explanation**

FY21-24 - Economic Assumptions Adjustments

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 5 | R-1 Program Element (Number/Name)<br>PE 0605075D8Z / *CMO Policy and Integration* | Project (Number/Name)<br>075 / *CMO Policy and Integration* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 075: *CMO Policy and Integration* | 93.045 | 2.100 | 1.618 | 1.648 | - | 1.648 | 1.675 | 1.705 | 1.741 | 1.776 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

To produce and sustain a Business Enterprise Architecture (BEA) to guide business transformation and business system investment actions for the DoD. The requirement to produce and maintain a BEA is codified in NDAA 2012, USC Title 10, Section 2222 with amplifying guidance from OMB. The proposed program provides improved capabilities to access and use the BEA information including descriptions of business processes and associated information assets; required capabilities and associated performance requirements; and governing laws, regulations and policies (LRPs).

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** CMO Policy and Integration | 2.100 | 1.618 | 1.648 |
| ***Description:*** - Defined and developed engineering and information technology development plans<br>- Established acquisition strategy and detailed implementation schedule<br>- Vetted project plan and implementation goals objectives and outcomes within the Defense Business Council | | | |
| ***FY 2020 Plans:***<br>- Execute detailed implementation schedule<br>- Deliver Defense Business Council goals objectives and outcomes<br>- Sustain this effort and deliver more efficient and effective applications and information resource capabilities supporting CMO Title 10 Section 2222 responsibilities for Defense Business Enterprise Architecture (BEA) compliance assessments to include:<br>• Complete initial operating capability for BEA Improvements<br>• Begin migration of capabilities from DISA computing environment to a secure DoD cloud service provider<br>• Mature and support transition planning for business intelligence and analytics (BIA) capabilities to support financial system integration and detailed audit reporting.<br>• Integrate BEA with ongoing DoD Reform initiatives. | | | |
| ***FY 2021 Plans:***<br>- Deliver Defense Business Council goals objectives and outcomes<br>- Sustain this effort and deliver more efficient and effective applications and information resource capabilities supporting CMO Title 10 Section 2222 responsibilities for Defense Business Enterprise Architecture (BEA) compliance assessments to include:<br>• Test BEA Improvements initial operating capability to integrate with CMO responsibilities as the CIO for Defense Business Systems. | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0605075D8Z / *CMO Policy and Integration* | **Project (Number/Name)**<br>075 / *CMO Policy and Integration* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| • Troubleshoot DoD cloud service provider BEA initial hosting configuration, operational performance and stage potential hosting environment transition to JEDI shared service solution.<br>• Mature and support transition of business intelligence and analytics (BIA) capabilities to DoD Chief Data Officer big data analytics environment.<br>• Improve BEA integration and visibility of ongoing DoD Reform initiatives.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Increase anticipates inflation | | | |
| **Accomplishments/Planned Programs Subtotals** | 2.100 | 1.618 | 1.648 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Follow the DoD Instruction 5000.75 process for Business Systems Requirements and Acquisition.

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0605075D8Z / *CMO Policy and Integration* | **Project (Number/Name)**<br>075 / *CMO Policy and Integration* |

**Product Development ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Capability to automate and generate metadata on ingest of architecture information | Option/ CPFF | DCMO : Mark Center | 0.000 | - | | - | | 0.648 | | - | | 0.648 | Continuing | Continuing | - |
| Extend user access to BEA via web services | Option/ CPFF | DCMO : Mark Center | 2.805 | 2.100 | | 1.300 | | 0.500 | | - | | 0.500 | Continuing | Continuing | - |
| Port BEA into Cloud evironment | Option/ CPFF | DCMO : Mark Center | 90.240 | - | | 0.318 | | 0.500 | | - | | 0.500 | Continuing | Continuing | - |
| | | **Subtotal** | 93.045 | 2.100 | | 1.618 | | 1.648 | | - | | 1.648 | Continuing | Continuing | N/A |

**Remarks**

* Partial completion of this performance metric is primarily the result of challenges in meeting the DoD's Cybersecurity Risk management Framework requirements necessary to transition capabilities from our contractor development site to an accredited DoD computing environment. The discover functionality is operating in the contractor's development environment but will require final hosting within a secure DoD computing environment to complete discovery capabilities via web services.

** DoD CIO Memorandum of 3 May 2018 directed migration of all 4th Estate applications and systems to milCloud 2.0 by end of FY2020

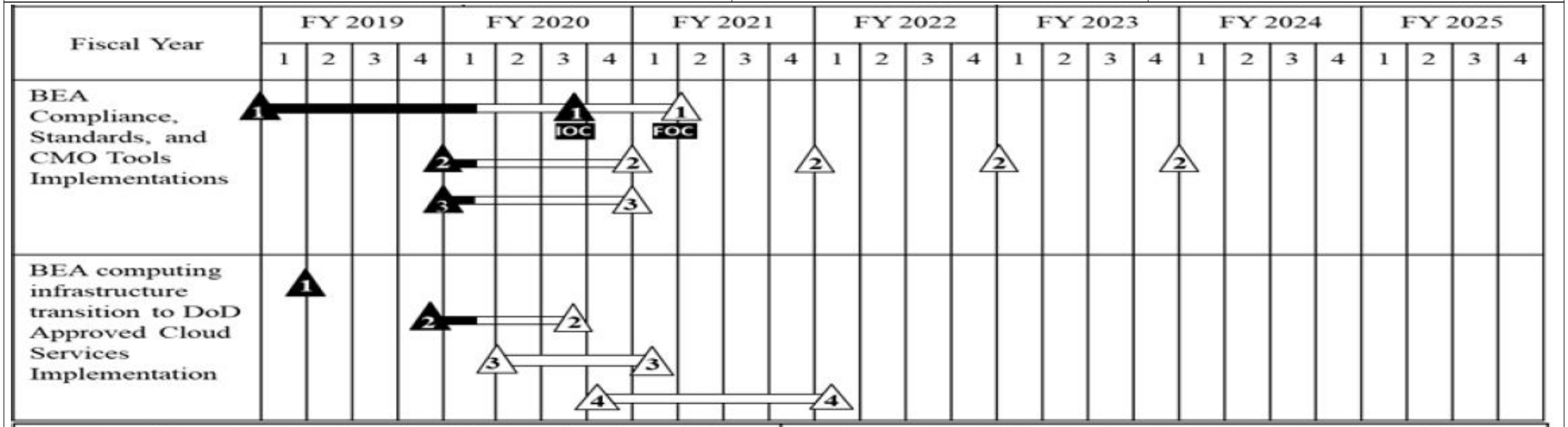
***The Business Enterprise Architecture is related to NDS Strategic Approach number three "Reform the Department for Greater Performance and Affordability" regarding, Streamline rapid, iterative approaches from development to fielding.

| | Prior Years | FY 2019 | | FY 2020 | | FY 2021 Base | | FY 2021 OCO | | FY 2021 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | 93.045 | 2.100 | | 1.618 | | 1.648 | | - | | 1.648 | Continuing | Continuing | N/A |

**Remarks**

NA

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0605075D8Z / *CMO Policy and Integration* | **Project (Number/Name)**<br>075 / *CMO Policy and Integration* |




| BEA Compliance, Standards, and CMO Tools Implementations | BEA computing infrastructure transition to DISA and Cloud Services Implementation |
|---|---|
| 1. Design and deliver a restructured BEA technology solution<br>2. BMA Business Capability Life Cycle (BCAC) tool development/deployment<br>3. Implement performance initiatives associated with iterative development and delivery of capabilities to enhance BEA alignment across the enterprise<br>4. Integrate BEA improved capabilities to execute the CMO's new CIO for Defense Business Systems responsibilities | 1. Perform required computing architecture approvals, security compliance and infrastructure certifications in accordance with DoD Cybersecurity Risk Management Framework<br>2. Develop and present compliance evidence required to obtain authorization to operate within the DISA enterprise computing ecosystem<br>3. In accordance with DoD CIO direction, plan and implement technical design requirements and computing environment architecture requirements for BEA transition to a secure DoD cloud service provider<br>4. Tailor and configure BEA hardware and software applications and operational parameters to leverage evolving DoD-approved cloud service provider capabilities/JEDI |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 5: *System Development & Demonstration (SDD)* | **R-1 Program Element (Number/Name)**<br>PE 0605210D8Z / *Defense-Wide Electronic Procurement Capabilities* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 78.912 | 6.126 | 9.619 | 8.279 | - | 8.279 | 7.286 | 7.411 | 7.491 | 7.640 | Continuing | Continuing |
| 021: *Defense-Wide Electronic Procurement Capabilities-Contingency* | 78.912 | 6.126 | 9.619 | 8.279 | - | 8.279 | 7.286 | 7.411 | 7.491 | 7.640 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

Defense-wide Electronic Procurement Capabilities provides for the development of critical enterprise-wide e-business requirements for the procurement community. These requirements result from statute, regulation, process re-engineering, internal control requirements and audit findings. This program provides for the introduction of innovative, time-saving, and cost-saving technologies into procurement processes across the Department. This RDT&E PE provides resources to conduct agile software development and testing on new or modified defense-wide e-business applications to ensure system and application development, integration and demonstration of production representative systems and capabilities.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 6.359 | 9.619 | 9.134 | - | 9.134 |
| Current President's Budget | 6.126 | 9.619 | 8.279 | - | 8.279 |
| Total Adjustments | -0.233 | 0.000 | -0.855 | - | -0.855 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | -0.232 | - | | | |
| • Other Program Adjustments | - | - | -0.354 | - | -0.354 |
| • Cancelled Accounts | -0.001 | - | - | - | - |
| • Economic Assumption | - | - | -0.009 | - | -0.009 |
| • Defense Wide Review Adjustment | - | - | -0.492 | - | -0.492 |

**Change Summary Explanation**

The decrease of $0.354 in FY 2021 is the result of A&S realignment to priority efforts for Industrial Policy/Special Programs/GSA.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 5 | R-1 Program Element (Number/Name)<br>PE 0605210D8Z / *Defense-Wide Electronic Procurement Capabilities* | Project (Number/Name)<br>021 / *Defense-Wide Electronic Procurement Capabilities- Contingency* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 021: *Defense-Wide Electronic Procurement Capabilities-Contingency* | 78.912 | 6.126 | 9.619 | 8.279 | - | 8.279 | 7.286 | 7.411 | 7.491 | 7.640 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

Defense-wide Electronic Procurement Capabilities provides for the development of critical e-business enterprise-wide requirements for the procurement community. These requirements may result from statute, regulation, process re-engineering or internal control requirements. This program provides opportunities for the introduction of innovative, time-saving, and cost-saving technologies into procurement processes across the Department. This RDT&E PE provides resources to conduct agile software development and testing on new or modified defense-wide e-business applications to ensure system and application development, integration and demonstration of production representative systems and capabilities.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Defense-Wide Electronic Procurement Capabilities- Contingency | 6.126 | 9.619 | 8.279 |

***Description:*** FY 2019 Accomplishments:
1) Improved high risk vendor identification, integration of defense-wide Government Furnished Property; contract closeout; contract clause execution; oversight of Contracting Officer Representatives and Purchase Card officials.
2) Established capability to define DoD organization hierarchy, track Procurement Administrative Lead Time, and contractors' authority to access supply authorities and property.
3) Established enterprise-wide capability to track protests as directed in the NDAA, and to store and search Contracting Officer warrants.

***FY 2020 Plans:***
FY 2020 plans focus on addressing audit findings resulting from the DoD financial audit. Specifically, improvements are needed to strengthen Government Furnished Property management (an identified material weakness) of property loss while in the hands of contractors as well as to implement data exchange standards across the finance and procurement community. DoD must also implement across enterprise-wide systems the new data standard replacing the Dun and Bradstreet identifier. The new data element is the Unique Entity Identifier that will impact every finance, logistics, and procurement system across DoD. Additionally, an enterprise-wide searchable Commercial Item Determination repository will be established as directed in the NDAA. Initial steps will be taken to define a data standard for a Commercial Catalog critical to underpinning DoD's ability to track prices of commercial items as well as capture item provenance as required in statute. The ability to enhance supply chain risk data mining will continue and the use of robotics will be explored. Issues identified with existing capability for contract closeout, contract clause execution,

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0605210D8Z / *Defense-Wide Electronic Procurement Capabilities* | **Project (Number/Name)**<br>021 / *Defense-Wide Electronic Procurement Capabilities- Contingency* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Contracting Officer Representatives and Purchase Card officials, Procurement Administrative Lead Time and DoD organization hierarchy will continue as operational implementation matures.<br><br>***FY 2021 Plans:***<br>FY 2021 plans will focus on refining audit findings resulting from the DoD financial audit. Specifically, improvements will focus on property reutilization and disposal while in the hands of contractors. Requirements to implement the Unique Entity Identifier (replacing the Dun and Bradstreet identifier) will continue. As data exchange standards continue to mature across the finance and procurement community they will be implemented for procurement enterprise systems. Steps taken in FY2020 regarding the Commercial Catalog data standard will be refined based on industry feedback. The ability to enhance supply chain risk data mining will continue as will the exploration of robotics. Issues identified with existing capability for contract closeout, contract clause execution, Contracting Officer Representatives and Purchase Card officials. Procurement Administrative Lead Time and DoD organization hierarchy will continue as operational implementation matures.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The $1.340 million decrease is the result of planned program changes in OUSD(A&S) and the Defense Wide Review. | | | |
| **Accomplishments/Planned Programs Subtotals** | 6.126 | 9.619 | 8.279 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 5 | R-1 Program Element (Number/Name)<br>PE 0605210D8Z / *Defense-Wide Electronic Procurement Capabilities* | Project (Number/Name)<br>021 / *Defense-Wide Electronic Procurement Capabilities- Contingency* | |

**Product Development ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Contract Business Systems Development | Various | DLA, JTIC, WPAFB : FORT BELVOIR, SCOTT AFB | 75.459 | 5.300 | | 9.619 | | 8.279 | | - | | 8.279 | - | - | - |
| | | **Subtotal** | 75.459 | 5.300 | | 9.619 | | 8.279 | | - | | 8.279 | - | - | N/A |

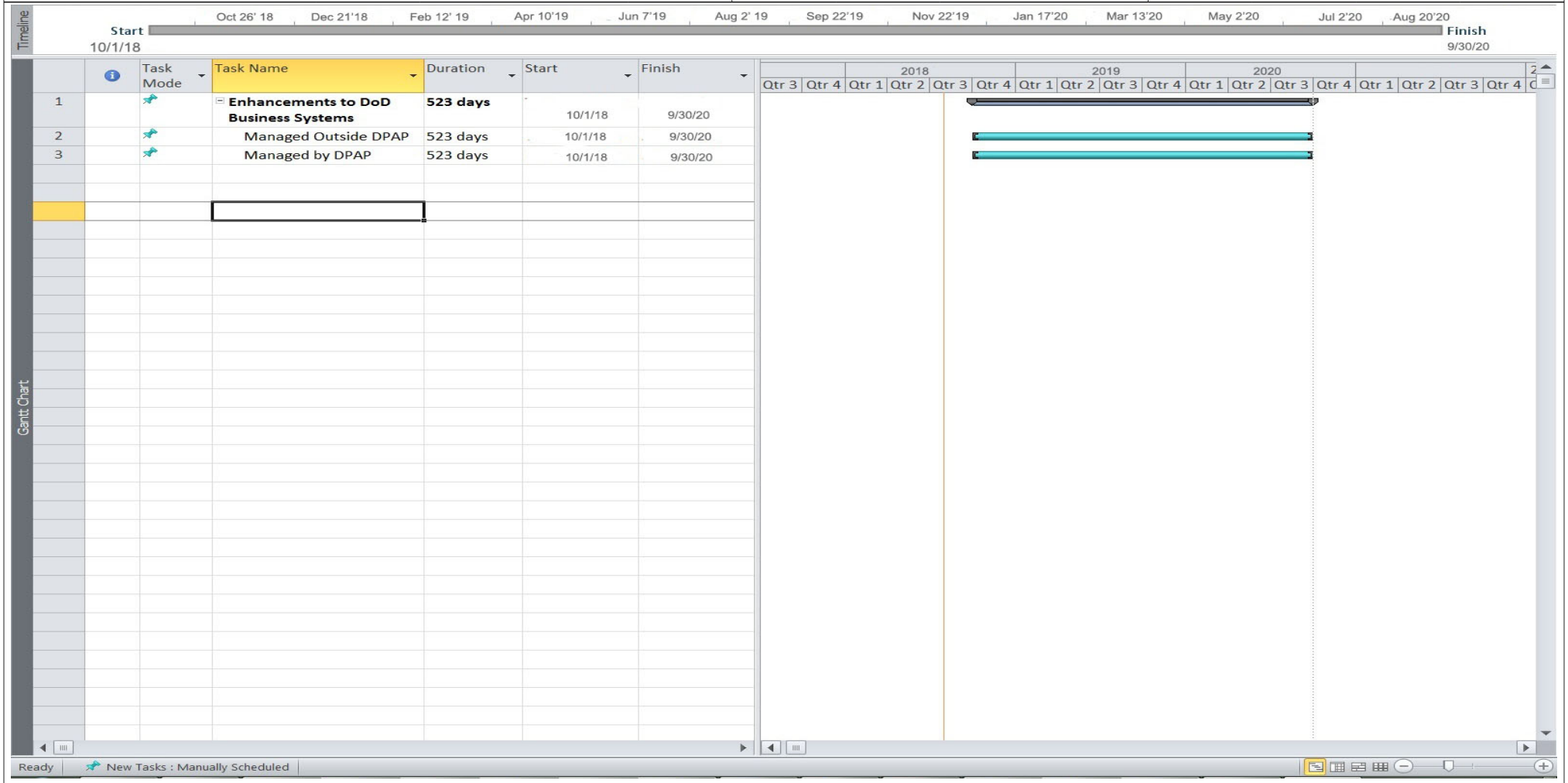
**Test and Evaluation ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Interoperability Testing | Various | DLA, JTIC, WPAFB : FORT BELVOIR, SCOTT AFB | 3.453 | 0.826 | | - | | - | | - | | - | - | - | - |
| | | **Subtotal** | 3.453 | 0.826 | | - | | - | | - | | - | - | - | N/A |

| | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | 78.912 | 6.126 | | 9.619 | | 8.279 | | - | | 8.279 | - | - | N/A |

**Remarks**

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0605210D8Z / *Defense-Wide Electronic Procurement Capabilities* | **Project (Number/Name)**<br>021 / *Defense-Wide Electronic Procurement Capabilities- Contingency* |



| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0605210D8Z / *Defense-Wide Electronic Procurement Capabilities* | **Project (Number/Name)**<br>021 / *Defense-Wide Electronic Procurement Capabilities- Contingency* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***N/A*** | | | | |
| Enhancements Managed outside of DPAP | 1 | 2018 | 4 | 2020 |
| ***Not Applicable*** | | | | |
| Enhancements Managed by DPAP | 1 | 2018 | 4 | 2020 |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 5: *System Development & Demonstration (SDD)* | **R-1 Program Element (Number/Name)**<br>PE 0605294D8Z / *Trusted and Assured Microelectronics* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 59.516 | 94.617 | 175.032 | 107.585 | - | 107.585 | 115.315 | 91.871 | 68.596 | 69.991 | Continuing | Continuing |
| 812: *Trusted Mask Trust Approach* | 0.000 | 2.000 | 2.000 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| 809: *New Trust Approach Demonstration* | 59.516 | 12.963 | 13.381 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| 822: *Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) Enhancement and Demonstration* | 0.000 | 79.654 | 159.651 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| 902: *Access to State-of-the-Art (SOTA) Microelectronics - Demonstration* | - | 0.000 | 0.000 | 54.045 | - | 54.045 | 54.355 | 55.871 | 44.596 | 45.503 | Continuing | Continuing |
| 903: *Access to Advanced Packaging and Testing - Demonstration* | 0.000 | 0.000 | 0.000 | 39.040 | - | 39.040 | 38.960 | 23.000 | 10.000 | 10.203 | Continuing | Continuing |
| 905: *Address DoD Unique Needs Especially Radiation Hardening - Demonstration* | - | 0.000 | 0.000 | 14.500 | - | 14.500 | 22.000 | 13.000 | 14.000 | 14.285 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

This Program Element (PE) supports microelectronics modernization activities that enable defense systems to keep pace with commercial microelectronics technological advances, reduce reliance on obsolete microelectronics, and mitigate the Department's reliance on sole source foundries for assured state-of-the-art (SOTA) microelectronics. It addresses the challenges of 1) having enduring access to a multiplicity of modern manufacturing processes that require commercial volumes to maintain long term viability and 2) protecting the intellectual property (IP) of the microelectronic parts that are manufactured.

This PE supports the 2018 National Defense Strategy's (NDS) line of effort to build a more lethal force through modernization of key capabilities, the NDS defense objective of establishing an unmatched twenty-first century National Security Innovation Base that effectively supports Department operations and sustains security and solvency, and the NDS strategic approach of reforming the Department's business practices by simultaneously increasing performance and affordability while still minimizing risk.

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 5: *System Development & Demonstration (SDD)* | **R-1 Program Element (Number/Name)**<br>PE 0605294D8Z *I Trusted and Assured Microelectronics* |

This PE supports the OUSD(R&E) Microelectronics Modernization Roadmap. The primary areas of focus of this roadmap include the following: access to advanced packaging and test; quantifiable assurance and secure design; foundry access; verification and validation; policies, standards, and Joint Federated Assurance Center (JFAC) governing body; access to radiation hardened microelectronics; access to non-complementary metal oxide semiconductor (CMOS) SOTA microelectronics; disruptive research and development; education and workforce development; trusted foundry and obsolescence; and supply chain awareness and security.

Recognizing that an assured supply of microelectronics is a U.S. Government (USG)-wide concern, this activity will interface with interagency partners to take into account interagency requirements, opportunities for collaboration, and strategic decisions that can be made to limit the overall cost of these requirements to the USG.

This activity is being led by the Under Secretary of Defense for Research and Engineering.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 95.959 | 175.032 | 66.949 | - | 66.949 |
| Current President's Budget | 94.617 | 175.032 | 107.585 | - | 107.585 |
| Total Adjustments | -1.342 | 0.000 | 40.636 | - | 40.636 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | -1.328 | - | | | |
| • Other Adjustments | -0.014 | - | -0.548 | - | -0.548 |
| • Economic Assumption | - | - | -0.066 | - | -0.066 |
| • Increase for Access to SOTA Quantifiably Assured Microelectronics | - | - | 41.250 | - | 41.250 |

| Congressional Add Details ($ in Millions, and Includes General Reductions) | FY 2019 | FY 2020 |
|---|---|---|
| **Project:** 822: *Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) Enhancement and Demonstration* | | |
| Congressional Add: *Next Generation Microelectronics* | 40.000 | - |
| Congressional Add Subtotals for Project: 822 | 40.000 | - |
| Congressional Add Totals for all Projects | 40.000 | - |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 5: *System Development & Demonstration (SDD)* | **R-1 Program Element (Number/Name)**<br>PE 0605294D8Z *I Trusted and Assured Microelectronics* |

**Change Summary Explanation**

In FY 2021, Project 812 "Trusted Mask" will be eliminated. Project 809 "New Trust Demonstration" and Project 822 "Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC)" activities will be re-aligned under three new project codes to correctly align Program Element (PE) funding in support of a zero-trust philosophy and reflective of current priorities. The new project codes are: (1) P902 Access to State-of-the-Art (SOTA) Microelectronics - Demonstration; (2) P903 Access to Advanced Packaging and Testing - Demonstration; and (3) P905 Address DoD Unique Needs Especially Radiation Hardening - Demonstration.

In FY 2021, $41.250 million was added to support enhanced and assured microelectronics design, domestic manufacturing capability, including heterogeneous integration and low volume applications, and a proactive awareness and security effort to identify and mitigate critical microelectronics supply chain threats.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 5 | R-1 Program Element (Number/Name)<br>PE 0605294D8Z / *Trusted and Assured Microelectronics* | Project (Number/Name)<br>812 / *Trusted Mask Trust Approach* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 812: *Trusted Mask Trust Approach* | 0.000 | 2.000 | 2.000 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

This project staffs and supports operation of a new secure (SECRET-level) photomask manufacturing capability at an existing state-of-the-art (SOTA) commercial photomask manufacturing supplier to secure masks and design intellectual property (IP) of acquisition programs during photomask data preparation, parsing and manufacturing. This capability can be used in conjunction with both Trusted and untrusted foundries. This capability will mitigate a supply chain gap for trusted masks at technology node sizes between 130 nanometers (nm) and 12/14nm.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Trusted Mask Trust Approach | 2.000 | 2.000 | - |
| ***FY 2020 Plans:***<br>Continuation of FY 2019 plan to equip and staff the new secure (SECRET-level) photomask manufacturing capability at the SOTA commercial photomask manufacturing supplier. | | | |
| ***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding for this Project Code will end in FY 2020. | | | |
| **Accomplishments/Planned Programs Subtotals** | 2.000 | 2.000 | - |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0605294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>812 / *Trusted Mask Trust Approach* |

**Product Development ($ in Millions)**

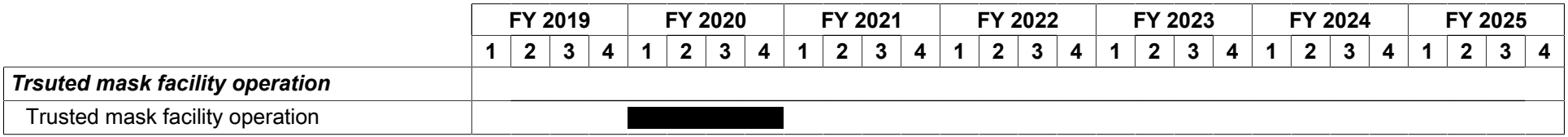
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Trusted Mask Trust Approach | MIPR | Defense Microelectronics Activity (DMEA) : California | 0.000 | 2.000 | Mar 2019 | 2.000 | Mar 2020 | - | | - | | - | Continuing | Continuing | - |
| | | **Subtotal** | 0.000 | 2.000 | | 2.000 | | - | | - | | - | Continuing | Continuing | N/A |

| | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | 0.000 | 2.000 | | 2.000 | | - | | - | | - | Continuing | Continuing | N/A |

**Remarks**

NA

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0605294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>812 / *Trusted Mask Trust Approach* |



| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0605294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>812 / *Trusted Mask Trust Approach* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***Trsuted mask facility operation*** | | | | |
| Trusted mask facility operation | 1 | 2020 | 4 | 2020 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 5 | R-1 Program Element (Number/Name)<br>PE 0605294D8Z / *Trusted and Assured Microelectronics* | Project (Number/Name)<br>809 / *New Trust Approach Demonstration* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 809: *New Trust Approach Demonstration* | 59.516 | 12.963 | 13.381 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

This project funds a program of research to demonstrate the next generation, technology-driven approach to microelectronics trust and assurance, to include state-of-the-art (SOTA) microelectronics, to ensure continued access to SOTA microelectronic technologies, while maintaining the required level of assurance in all environments. DoD's ability to access commercial technology for its custom secure, trusted and assured needs is diminishing as SOTA suppliers become fewer and more focused on serving the global commercial market. DoD's technology needs are broad, and relying on a single source supplier is not feasible. Alternative, advanced manufacturing methods, technologies, and design tools are needed to produce secure, trusted and assured SOTA parts from commercial sources and to preserve access to these advanced nodes while protecting DoD and Defense Industrial Base (DIB) intellectual property (IP) from exploitation. It is also intended to dramatically improve the capabilities of the core trusted and assured microelectronics (T&AM) laboratories with regard to verification and validation in support of microelectronics assurance.

This program of research will demonstrate quantitative and innovative design, manufacturing, imaging, tagging, and control and assessment approaches for protecting DoD's microelectronics supply chain and IP. Furthermore a quantitative assurance methodology using metrics from assurance mitigations will be demonstrated to enable access to SOTA microelectronics. Assurance mitigations will be demonstrated for Field Programmable Gate Array devices in advanced technology nodes for next-generation strategic systems, obfuscation and disaggregation technologies, and other assurance mitigations. It will demonstrate advanced imaging technologies and forensics, Design for Assurance techniques, active hardware assurance controls, electronic component markers, and a data and analysis capability to enable auditing, lifecycle provenance and traceability, and independent verification and validation of commercial and specialized DoD designs and IP. It also demonstrates and implements concepts for the cost-effective production of custom microelectronics in low volumes and protection of sensitive IP from exploitation. In addition it demonstrates and implements new technologies to assess the security of field-programmable gate array (FPGA) assurance mechanisms.

Assurance technologies that can be applied in a broad range of trusted and commercial environments can mitigate the risks associated with sole-source suppliers, and increase the ability of the U.S. Government (USG) to leverage commercial capabilities. The suite of demonstrated technologies, e.g., alternative manufacturing methods and design tools, will enable DoD to obfuscate the purpose of sensitive devices, verify their origin and function, and protect sensitive IP from exploitation even while using the global supply chain for most hardware. In cases where the risk involved precludes that level of commercial collaboration, low-volume manufacturing technologies demonstrated under this project would permit DoD to more cheaply produce low volumes of sensitive microelectronics in secure environments. The project will also support demonstration of a repository of third-party IP and electronic design automation (EDA) and assurance tool marketplace to expedite circuit design and transition promising technologies to use.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** New Trust Approach Demonstration | 12.963 | 13.381 | - |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0605294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>809 / *New Trust Approach Demonstration* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***FY 2020 Plans:***<br>Continuation of FY 2019 activities including the following:<br>• Demonstrate acquisition program pilots and technology demonstrations, followed by transition of these capabilities to new programs in the following fiscal years.<br>• Evaluate quantifiable assurance technologies and techniques through efforts that may include the conduct of studies, broad agency announcements (BAAs), and other efforts to coordinate research programs across USG R&D organizations, academia and industry.<br>• Identify potential transition issues and aid in transition through joint collaboration between research teams and stakeholders with a focus on evaluations of prototypes, test articles and beta versions of tools, IP, techniques, methods, etc. and their use in operationally-realistic scenarios.<br>• Demonstrate and evaluate new quantifiable assurance technologies for FPGA devices through BAA awards selected in FY 2019 and throughout FY 2020.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>P809 funds will transfer from this project code (Pcode) to new P902 “Access to SOTA Microelectronics Demonstration” to properly align funding in support of the zero-trust philosophy and reflect current priorities. Total funding will increase between the two years from $13.381 million to $23.215 million. | | | |
| **Accomplishments/Planned Programs Subtotals** | 12.963 | 13.381 | - |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0605294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>809 / *New Trust Approach Demonstration* |

**Product Development ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| New Trust Approach Demonstration Program Support | MIPR | Various (Defense Advanced Research Projects Agency, Air Force, Army, Navy, National Security Agency) : Various | 59.516 | 12.963 | Mar 2019 | 13.381 | Mar 2020 | - | | - | | - | Continuing | Continuing | - |
| | | **Subtotal** | 59.516 | 12.963 | | 13.381 | | - | | - | | - | Continuing | Continuing | N/A |

**Remarks**

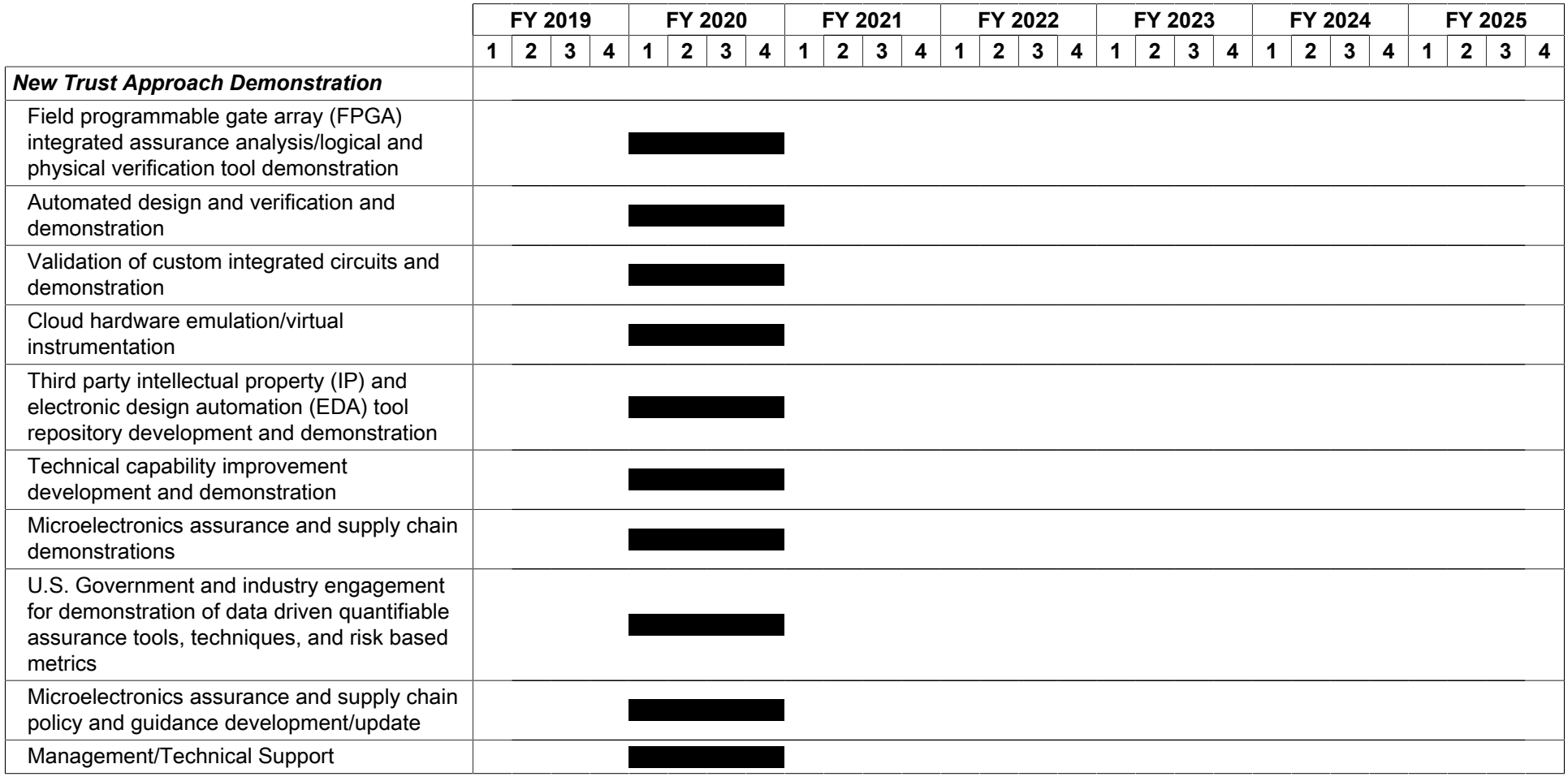
NA

| | Prior Years | FY 2019 | | FY 2020 | | FY 2021 Base | | FY 2021 OCO | | FY 2021 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | 59.516 | 12.963 | | 13.381 | | - | | - | | - | Continuing | Continuing | N/A |

**Remarks**

N/A

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0605294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>809 / *New Trust Approach Demonstration* |



| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0605294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>809 / *New Trust Approach Demonstration* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***New Trust Approach Demonstration*** | | | | |
| Field programmable gate array (FPGA) integrated assurance analysis/logical and physical verification tool demonstration | 1 | 2020 | 4 | 2020 |
| Automated design and verification and demonstration | 1 | 2020 | 4 | 2020 |
| Validation of custom integrated circuits and demonstration | 1 | 2020 | 4 | 2020 |
| Cloud hardware emulation/virtual instrumentation | 1 | 2020 | 4 | 2020 |
| Third party intellectual property (IP) and electronic design automation (EDA) tool repository development and demonstration | 1 | 2020 | 4 | 2020 |
| Technical capability improvement development and demonstration | 1 | 2020 | 4 | 2020 |
| Microelectronics assurance and supply chain demonstrations | 1 | 2020 | 4 | 2020 |
| U.S. Government and industry engagement for demonstration of data driven quantifiable assurance tools, techniques, and risk based metrics | 1 | 2020 | 4 | 2020 |
| Microelectronics assurance and supply chain policy and guidance development/update | 1 | 2020 | 4 | 2020 |
| Management/Technical Support | 1 | 2020 | 4 | 2020 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0605294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>822 / *Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) Enhancement and Demonstration* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 822: *Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) Enhancement and Demonstration* | 0.000 | 79.654 | 159.651 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

This project supports the DoD microelectronics strategy by ensuring the availability of and access to the advanced, assured microelectronics that are critical for DoD and national security systems. It will deliver tools to protect the IP confidentiality and integrity for a broad range of systems and missions and will provide a path for the production of these articles.

This project supports a broader national strategy to focus resources, policies, and incentives to enhance current and next generation defense capability by:
1) maintaining access to U.S. domestic production of state-of-the-art (SOTA) technology;
2) enabling solutions for DoD heterogeneous integration and advanced packaging needs;
3) leveraging commercial technology through demonstrations with industry of dual-use technologies with built in assurance, and incentivizing stronger commercial engagement through piloting acquisition reforms and providing incentives for cooperative R&D and trade;
4) enhancing state-of-the-practice (SOTP) foundries in the U.S. to produce more advanced technologies to better serve low-volume customers in the aerospace and defense community;
5) accelerating the transition and capture of the next generation of microelectronics through commercial partnerships and lowering domestic barriers to innovation in coordination with the Defense Advanced Research Projects Agency (DARPA) Electronics Resurgence Initiative (ERI); and
6) promoting threat awareness, proactive protection, and supply chain security to ensure these investments continue to benefit the U.S.

MINSEC activities are categorized into the following focus areas: access to specialized SOTA and dual use microelectronics technology, collection and analysis of data for metrics driven quantifiable assurance, maintaining and enhancing U.S capability though capture and secure, and transition of next generation microelectronics technology including demonstration and capability insertion; microelectronics-focused workforce training; radiation hardening by process (RHBP) and radiation hardening by design (RHBD) in advanced technology nodes for next-generation strategic systems; and radio frequency (RF) and optoelectronic (OE) microelectronics.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) | 39.654 | 159.651 | - |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0605294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>822 / *Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) Enhancement and Demonstration* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Description:*** This project's activities will mature and evaluate quantifiable microelectronics access and assurance technologies and techniques through efforts that may include the conduct of studies and Broad Agency Announcements (BAAs) and other efforts to coordinate research programs across USG R&D organizations, academia, and industry.<br><br>***FY 2020 Plans:***<br>This project will engage early on with potential stakeholders to identify potential transition issues and aid in transition through joint collaboration between research teams and stakeholders with a focus on demonstration and evaluation of prototypes, test articles, and beta versions of tools, IP, techniques, methods, etc. and their use in operationally-realistic scenarios. It will continue to promote the use of data driven security features and software and hardware assurance tools and capabilities for DoD systems<br>• Pilot quantifiable secure co-design capabilities and supply chain tools using commercially-available cloud-based services with/at commercial partners to secure commercial IP.<br>• Demonstrate secure, accessible and cost effective SOTA heterogeneous integration design, assembly and test capability. Establish a SOTA Heterogeneous Integrated Prototype Packaging sources for SOTA Digital and SOTA radio frequency (RF) applications.<br>• Support the demonstration of proactive awareness and security of the microelectronics supply chain including supply chain intelligence/counterintelligence, crypto-provenance/tracking, informed authorities, and standards.<br>• Coordinate with Office of the Director of National Intelligence, to define the full end-to-end supply chain issues and address critical security threats.<br>• Leverage and enhance investments from local, state, federal government, and industry to demonstrate domestic and agile high-mix, low-volume microelectronics manufacturing and packaging capabilities.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Project Code (Pcode) 822 funds will transfer from this Pcode to new Pcodes to correctly align Program Element (PE) funding in support of the zero-trust philosophy and reflect current priorities. They are: P902 Access to SOTA Microelectronics; P903 Access to Advanced Packaging and Test; and P905 Address DoD Unique Needs. Total funding will decrease between the two years from $159.651 million to $84.436 million with $54.111 million transferring to SOTA Access, $39.040 million transferring to Advanced Packaging Access, and $14.500 million transferring to Address DoD Unique Needs. | | | |
| **Accomplishments/Planned Programs Subtotals** | 39.654 | 159.651 | - |

| | FY 2019 | FY 2020 |
|---|---|---|
| ***Congressional Add:*** Next Generation Microelectronics | 40.000 | - |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0605294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>822 / *Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) Enhancement and Demonstration* |

| | FY 2019 | FY 2020 |
|---|---|---|
| ***FY 2019 Accomplishments:*** • Initiated partnership with commercial state of the art (SOTA) foundry to demonstrate design mobility.<br>• Enhanced service lab design and verification expertise through on-site subject matter experts and engagements with commercial entities.<br>• Initiated commercial IP assurance analysis<br>• Conducted independent vetting of reduced instruction set computer (RISC) architectures using commercial partners.<br>• Evaluated specialized field programmable gate array (FPGA) designs from multiple commercial vendors for potential benefits and vulnerabilities.<br>• Completed design of 14nm artificial intelligence system on chip (SoC).<br>• Engaged academia in demonstrating comprehensive pre-silicon security verification toolset. | | |
| **Congressional Adds Subtotals** | 40.000 | - |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0605294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>822 / *Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) Enhancement and Demonstration* |

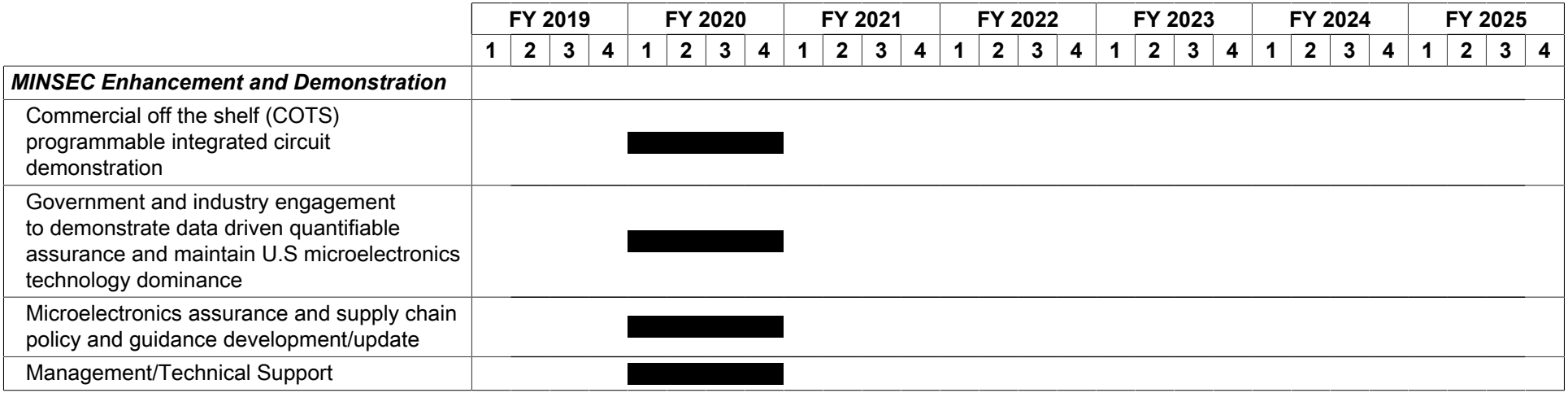
**Product Development ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) Innovation and Development | MIPR | Defense Advanced Research Projects Agency, Air Force, Army, Navy, National Security Agency : Various | - | 79.654 | Mar 2019 | 159.651 | Mar 2020 | - | | - | | - | Continuing | Continuing | - |
| | | **Subtotal** | - | 79.654 | | 159.651 | | - | | - | | - | Continuing | Continuing | N/A |

| | Prior Years | FY 2019 | | FY 2020 | | FY 2021 Base | | FY 2021 OCO | | FY 2021 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | - | 79.654 | | 159.651 | | - | | - | | - | Continuing | Continuing | N/A |

**Remarks**

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0605294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>822 / *Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) Enhancement and Demonstration* |



| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0605294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>822 / *Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) Enhancement and Demonstration* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***MINSEC Enhancement and Demonstration*** | | | | |
| Commercial off the shelf (COTS) programmable integrated circuit demonstration | 1 | 2020 | 4 | 2020 |
| Government and industry engagement to demonstrate data driven quantifiable assurance and maintain U.S microelectronics technology dominance | 1 | 2020 | 4 | 2020 |
| Microelectronics assurance and supply chain policy and guidance development/update | 1 | 2020 | 4 | 2020 |
| Management/Technical Support | 1 | 2020 | 4 | 2020 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 5 | R-1 Program Element (Number/Name)<br>PE 0605294D8Z / *Trusted and Assured Microelectronics* | Project (Number/Name)<br>902 / *Access to State-of-the-Art (SOTA) Microelectronics - Demonstration* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 902: *Access to State-of-the-Art (SOTA) Microelectronics - Demonstration* | - | 0.000 | 0.000 | 54.045 | - | 54.045 | 54.355 | 55.871 | 44.596 | 45.503 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

In 2021, this project incorporates portions of projects P809 and P822. It will establish multiple strategic partnerships with existing commercial state-of-the-art (SOTA) domestic foundries to develop a data-driven, risk-based approach to supply chain protection and demonstrate the assured manufacture of advanced electronic components.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Design | - | - | 16.000 |

***Description:*** The enhancement will demonstrate quantifiably assured design concepts in manufactured systems, enabling a formal risk-based approach to protection techniques. Manufactured microelectronics will be tested to ensure that IP protections meet or exceed current National Security Agency (NSA) standards for intellectual property (IP) protection, and to demonstrate DoD's ability to detect certain malicious supply chain attacks on DoD microelectronics.

The enhancement will also demonstrate a new data driven quantifiable assurance paradigm for supply chain protection. It will strengthen security while improving access, exposing no sensitive IP to the foundry and requiring post-manufacture validation of foundry products. The enhancement will demonstrate quantifiably assured design concepts in manufactured systems, enabling a formal risk-based approach to protection techniques. Manufactured microelectronics will be tested to ensure that IP protections meet or exceed current NSA standards for IP protection, and to demonstrate DoD's ability to detect certain malicious supply chain attacks on DoD microelectronics.

Successful implementation will transition these technologies to use in DoD programs, obtain access to multiple commercial microelectronics facilities, and solidify a data-driven approach to supply chain protection, including keeping pace with the rapid advancements in microelectronics technology and the globalization of this industry sector. It will provide the basics for updating and strengthening DoD assurance policy and includes collaborating with industry to employ data driven quantifiable standards.

***FY 2021 Plans:***

Successful implementation will transition these technologies to use in DoD programs, obtain access to multiple (2) commercial microelectronics facilities, and solidify a data-driven approach to supply chain protection.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0605294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>902 / *Access to State-of-the-Art (SOTA) Microelectronics - Demonstration* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Planned activities transitioning from projects P809 and P822 as follows:<br>• Demonstrate vetted IP repository, which will be available for DoD use of assured tools distributed via cloud services.<br>• Achieve initial operational capability (IOC) for secure co-design capabilities and supply chain tools using commercially-available cloud-based services with/at co-development partners for commercial IP.<br>• Demonstrate enhance secure design and cloud capability with new tools and techniques.<br>• Continue to build-out secured design environments and persistent technical expertise.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding transfer from P809 and P822 to properly align funding in support of the zero-trust philosophy and reflect current priorities. | | | |
| ***Title:*** Foundry<br>***Description:*** This activity will implement multiple foundries process design kit (PDK) environments ensuring the government is not dependent on one single source for critical components.<br>***FY 2021 Plans:***<br>Commercial foundries generate enormous amounts of data on their processes as a best practice for quality assurance to improve reliability and increase yield. It will collect and utilize this data to generate and allow quantitative comparison of performance and security metrics in the design and test stage of the microelectronics lifecycle, thereby mitigating risk.<br>Planned activities transitioning from project P822 as follows:<br>• Demonstrate assured access to multiple SOTA domestic fabrication sources.<br>• Continued build-out of secured design environments and persistent expertise.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding transfer from P809 and P822 to properly align funding in support of the zero-trust philosophy and reflect current priorities. | - | - | 3.798 |
| ***Title:*** Data Driven Quantifiable Assurance Demonstration<br>***Description:*** This activity includes verifying the ability to fabricate classified and/or export-controlled designs in on-shore commercial foundries– funding will establish multiple strategic partnerships with existing commercial domestic foundries to develop a data-driven, risk-based approach to supply chain protection and demonstrate the assured manufacture of advanced electronic components.<br>***FY 2021 Plans:***<br>The project will demonstrate the technical means for protecting IP and obfuscating the final user function from the supply chain will be realized using personalization, programmability and software, following application specific integrated circuit (ASIC) | - | - | 34.247 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0605294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>902 / *Access to State-of-the-Art (SOTA) Microelectronics - Demonstration* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| manufacturing. Efforts are on-going to update International Traffic in Arms Regulations (ITAR) and Export Administration Regulations (EAR) policy in this area. Funding will support activities to enhance the export control regime so that it maintains or strengthens current protections while enabling access to commercial capabilities, products, and IP.<br><br>Planned activities transitioning from projects P-809 and P822 as follows:<br>• Conduct enhanced IP demonstration and analysis of data driven risk assessments using independent verification and validation (V&V), data captures, intelligence reports, probability of detection and false alarm rates, and game theoretics.<br>• Demonstrate scalable classified system for a design and verification ecosystem.<br>• Establishment and demonstration of commercial field programmable gate array (FPGA) screening capability.<br>• Continue to establish, demonstrate, and evaluate new quantifiable assurance technologies for FPGA devices.<br>• Align stakeholders with common concerns to demonstrate assurance enabled SOTA fabrication technologies.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding transfer from P809 and P822 to properly align funding in support of the zero-trust philosophy and reflect current priorities. | | | |
| **Accomplishments/Planned Programs Subtotals** | - | - | 54.045 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

N/A

**D. Acquisition Strategy**

N/A

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0605294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>902 / *Access to State-of-the-Art (SOTA) Microelectronics - Demonstration* |

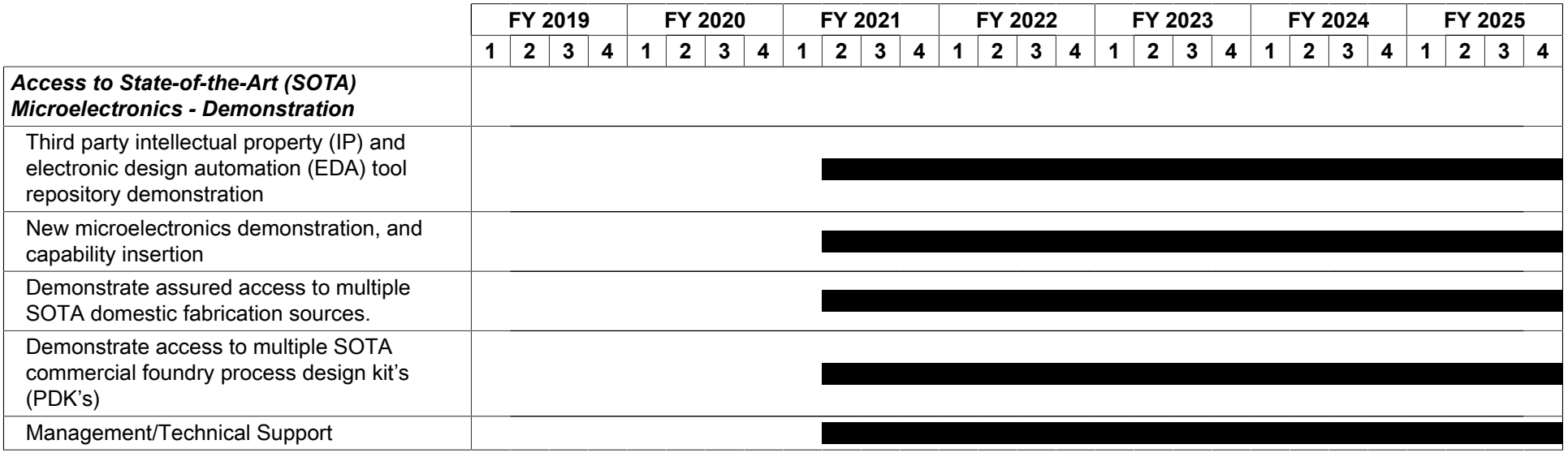
**Product Development ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Access to State-of-the-Art (SOTA) Microelectronics - Demonstration | MIPR | Defense Advanced Research Projects Agency, Air Force, Army, Navy, National Security Agency : Various | - | - | | - | | 54.045 | Mar 2021 | - | | 54.045 | Continuing | Continuing | - |
| | | **Subtotal** | - | - | | - | | 54.045 | | - | | 54.045 | Continuing | Continuing | N/A |

| | Prior Years | FY 2019 | | FY 2020 | | FY 2021 Base | | FY 2021 OCO | | FY 2021 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | - | - | | 0.000 | | 54.045 | | - | | 54.045 | Continuing | Continuing | N/A |

**Remarks**

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0605294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>902 / *Access to State-of-the-Art (SOTA) Microelectronics - Demonstration* |



| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0605294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>902 / *Access to State-of-the-Art (SOTA) Microelectronics - Demonstration* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***Access to State-of-the-Art (SOTA) Microelectronics - Demonstration*** | | | | |
| Third party intellectual property (IP) and electronic design automation (EDA) tool repository demonstration | 2 | 2021 | 4 | 2025 |
| New microelectronics demonstration, and capability insertion | 2 | 2021 | 4 | 2025 |
| Demonstrate assured access to multiple SOTA domestic fabrication sources. | 2 | 2021 | 4 | 2025 |
| Demonstrate access to multiple SOTA commercial foundry process design kit's (PDK's) | 2 | 2021 | 4 | 2025 |
| Management/Technical Support | 2 | 2021 | 4 | 2025 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 5 | R-1 Program Element (Number/Name)<br>PE 0605294D8Z / *Trusted and Assured Microelectronics* | Project (Number/Name)<br>903 / *Access to Advanced Packaging and Testing - Demonstration* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 903: *Access to Advanced Packaging and Testing - Demonstration* | 0.000 | 0.000 | 0.000 | 39.040 | - | 39.040 | 38.960 | 23.000 | 10.000 | 10.203 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

This project will leverage existing commercially available expertise and capability to deliver self-sustaining digital and radio frequency (RF) state-of-the-art (SOTA) heterogeneous integrated packaging (SHIP), assembly, and test capability.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Access to Advanced Packaging and Testing - Demonstration | - | - | 39.040 |
| ***FY 2021 Plans:***<br>This project will deliver an on-shore SHIP assembly and test capability. It will provide access to, personalization of, and customization for supporting DoD programs. It will enable a revolutionary leap in system performance that will greatly reduce size, weight and power (SWaP) by incorporating the immense advances in SOTA commercial off the shelf (COTS) processing technologies, such as field programmable gate arrays (FPGAs), microprocessors, and Graphic Processing Units (GPUs).<br><br>Planned activities transitioning from projects P809 and P822 as follows:<br>• Demonstrate enhance secure design and secure packaging with new tools and techniques.<br>• Continue demonstration of heterogeneous integration for secure packaging and test. | | | |
| ***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding transfer from P809 and P822 to Properly align funding in support of the zero-trust philosophy and reflect current priorities. | | | |
| **Accomplishments/Planned Programs Subtotals** | - | - | 39.040 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0605294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>903 / *Access to Advanced Packaging and Testing - Demonstration* | |

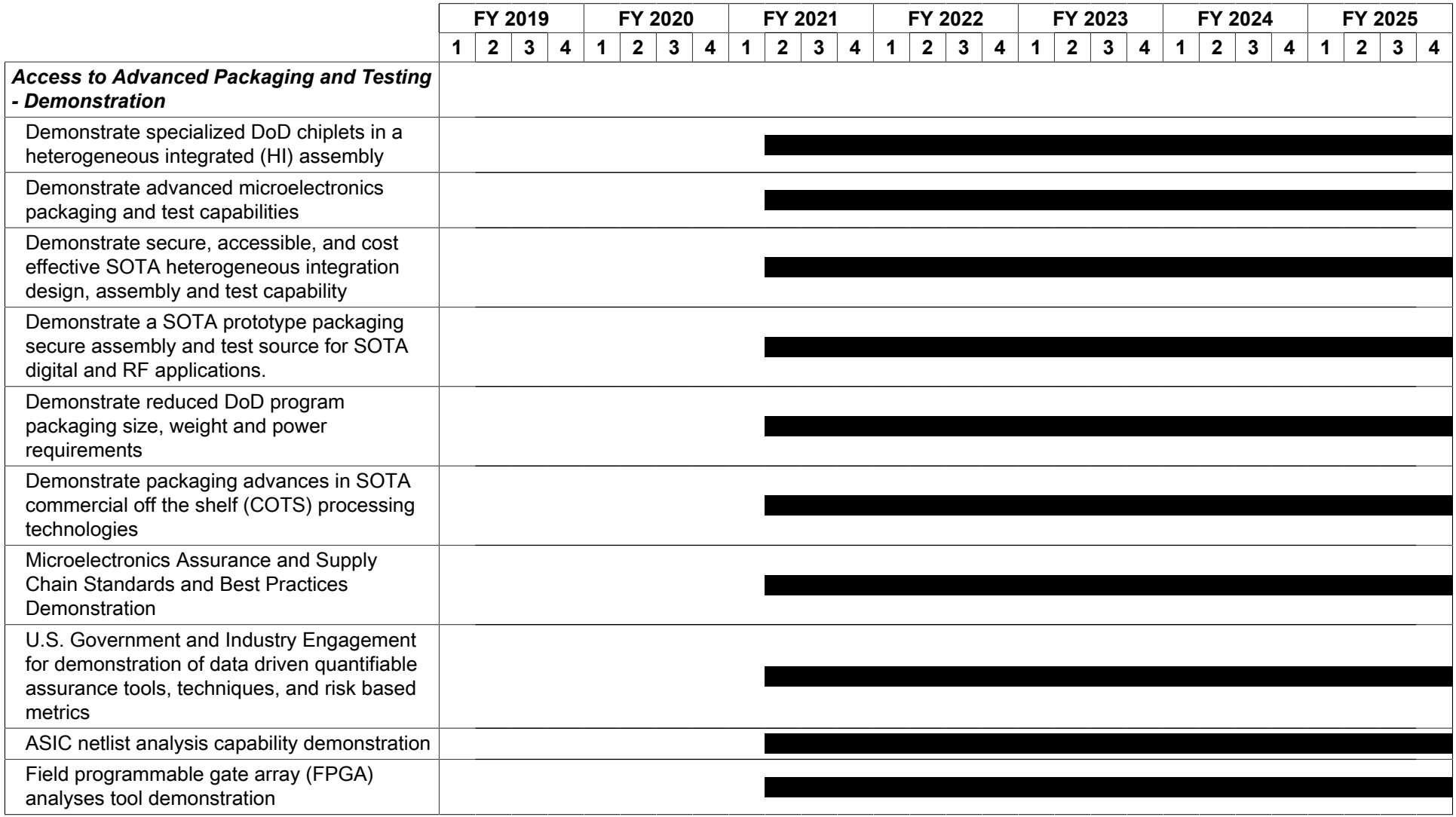
**Product Development ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Access to Advanced Packaging and Testing - Demonstration | MIPR | Defense Advanced Research Projects Agency, Air Force, Army, Navy, National Security Agency : Various | - | - | | - | | 39.040 | Mar 2021 | - | | 39.040 | Continuing | Continuing | - |
| | | **Subtotal** | - | - | | - | | 39.040 | | - | | 39.040 | Continuing | Continuing | N/A |

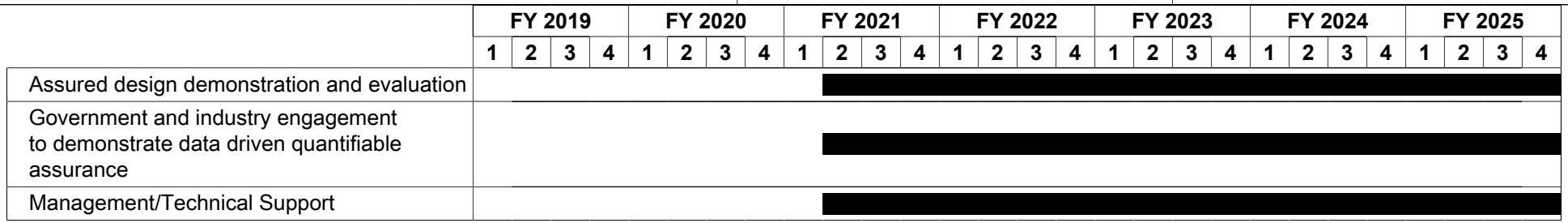
| | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | - | - | | 0.000 | | 39.040 | | - | | 39.040 | Continuing | Continuing | N/A |

**Remarks**

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0605294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>903 / *Access to Advanced Packaging and Testing - Demonstration* |



| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0605294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>903 / *Access to Advanced Packaging and Testing - Demonstration* |



| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0605294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>903 / *Access to Advanced Packaging and Testing - Demonstration* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***Access to Advanced Packaging and Testing - Demonstration*** | | | | |
| Demonstrate specialized DoD chiplets in a heterogeneous integrated (HI) assembly | 2 | 2021 | 4 | 2025 |
| Demonstrate advanced microelectronics packaging and test capabilities | 2 | 2021 | 4 | 2025 |
| Demonstrate secure, accessible, and cost effective SOTA heterogeneous integration design, assembly and test capability | 2 | 2021 | 4 | 2025 |
| Demonstrate a SOTA prototype packaging secure assembly and test source for SOTA digital and RF applications. | 2 | 2021 | 4 | 2025 |
| Demonstrate reduced DoD program packaging size, weight and power requirements | 2 | 2021 | 4 | 2025 |
| Demonstrate packaging advances in SOTA commercial off the shelf (COTS) processing technologies | 2 | 2021 | 4 | 2025 |
| Microelectronics Assurance and Supply Chain Standards and Best Practices Demonstration | 2 | 2021 | 4 | 2025 |
| U.S. Government and Industry Engagement for demonstration of data driven quantifiable assurance tools, techniques, and risk based metrics | 2 | 2021 | 4 | 2025 |
| ASIC netlist analysis capability demonstration | 2 | 2021 | 4 | 2025 |
| Field programmable gate array (FPGA) analyses tool demonstration | 2 | 2021 | 4 | 2025 |
| Assured design demonstration and evaluation | 2 | 2021 | 4 | 2025 |
| Government and industry engagement to demonstrate data driven quantifiable assurance | 2 | 2021 | 4 | 2025 |
| Management/Technical Support | 2 | 2021 | 4 | 2025 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 5 | R-1 Program Element (Number/Name)<br>PE 0605294D8Z / *Trusted and Assured Microelectronics* | Project (Number/Name)<br>905 / *Address DoD Unique Needs Especially Radiation Hardening - Demonstration* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 905: *Address DoD Unique Needs Especially Radiation Hardening - Demonstration* | - | 0.000 | 0.000 | 14.500 | - | 14.500 | 22.000 | 13.000 | 14.000 | 14.285 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

This project addresses the dual problems of commanding only a small market share while requiring an expansive range of unique microelectronics needs, from boutique and legacy components to state-of-the-art (SOTA) technologies. The Government must sustain specialty suppliers, given their criticality to national security. In particular, DoD needs access to a diverse microelectronics ecosystem to develop and acquire the application specific integrated circuit (ASICs) and personalized commercial off the shelf (COTS) components required for military radiation hardened and radio frequency and optical needs.

The Department frequently relies on commercial suppliers to optimize performance and reduce costs for sophisticated weapon system and secure network functionality. It is critical that DoD has future access to subject matter expertise, technology, and manufacturing.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Address DoD Unique Needs Especially Radiation Hardening - Demonstration | - | - | 14.500 |
| ***Description:*** Government-unique trusted design and manufacturing flows have been developed to enable a tier of trust for select ASIC parts; however, this approach addresses only a small subset of DoD microelectronics requirements (e.g., processors, memory, microcontrollers, field programmable gate arrays (FPGAs), and radiation-tolerant processors). | | | |
| ***FY 2021 Plans:***<br>DoD will partner with the intelligence community, the Department of Energy, and the National Aeronautics and Space Administration to demonstrate radiation hardened components that permit systems to operate in space and other harsh environments. State-of-the-practice (SOTP) and SOTA technologies will be characterized and developed in support of Radiation Hardened By Process (RHBP) and Radiation Hardened By Design (RHBD) activities in support DoD modernization programs with radiation hardened requirements. A similar situation exists for radio frequency and optical applications. These two applications reflect only a small market with unique costs and specifications, which does not inherently create incentive for industrial investment.<br><br>Planned activities transitioning from projects P-809 and P-822 as follows: | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0605294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>905 / *Address DoD Unique Needs Especially Radiation Hardening - Demonstration* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| • Demonstrate enhanced DoD Lab test and evaluation infrastructure required for verification and validation of radiation hardened microelectronics, technology characterization, and device modeling and simulation.<br>• Demonstrate advance radiation harden System on Chip(SOC) and memory technology in support DoD program modernization efforts with radiation hardened requirements.<br>• Demonstrate SOTP and SOTA technologies utilizing Radiation Hardened By Process (RHBP) and Radiation Hardened By Design (RHBD) activities in support DoD modernization programs with radiation hardened requirements.<br>• Provide coordination and subject matter expertise in support of the Strategic Radiation Hardened Electronics council (SRHEC) for the identification of technology gaps, technology roadmap development, and inform future investments.<br>• Procure and evaluate advanced Gallium Nitride (GaN) substrates to establish an assured source.<br>• Demonstrate assured GaN radio frequency (RF) foundry technology and host secure design challenges to optimize SOTA radio frequency optoelectronics (RFOE) intellectual property (IP) and test articles for frequency, bandwidth, efficiency, power, etc.<br>• Major milestones will be GaN wafer deliveries and assured GaN RF circuits via Secure Design Challenge.<br>• Continue to enhance the foundations of assurance for RF and optoelectronics (OE) applications by demonstrating new capabilities such as additive manufacturing.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding transfer from P809 and P822 to properly align funding in support of the zero-trust philosophy and reflect current priorities. | | | |
| **Accomplishments/Planned Programs Subtotals** | - | - | 14.500 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 5 | R-1 Program Element (Number/Name)<br>PE 0605294D8Z / *Trusted and Assured Microelectronics* | Project (Number/Name)<br>905 / *Address DoD Unique Needs Especially Radiation Hardening - Demonstration* | |

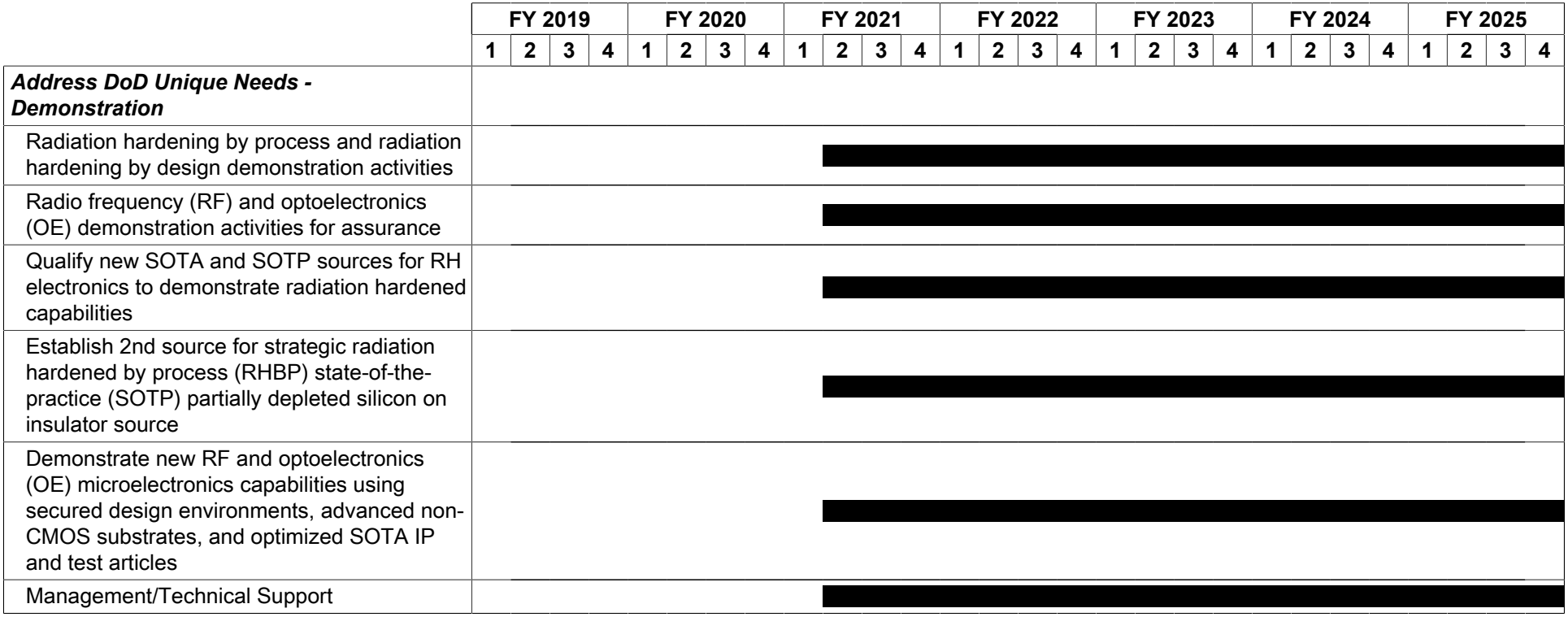
**Product Development ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Address DoD Unique Needs - Demonstration | MIPR | Defense Advanced Research Projects Agency, Air Force, Army, Navy, National Security Agency : Various | - | - | | - | | 14.500 | Mar 2021 | - | | 14.500 | Continuing | Continuing | - |
| | | **Subtotal** | - | - | | - | | 14.500 | | - | | 14.500 | Continuing | Continuing | N/A |

| | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | - | - | | 0.000 | | 14.500 | | - | | 14.500 | Continuing | Continuing | N/A |

**Remarks**

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0605294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>905 / *Address DoD Unique Needs Especially Radiation Hardening - Demonstration* |



| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0605294D8Z / *Trusted and Assured Microelectronics* | **Project (Number/Name)**<br>905 / *Address DoD Unique Needs Especially Radiation Hardening - Demonstration* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***Address DoD Unique Needs - Demonstration*** | | | | |
| Radiation hardening by process and radiation hardening by design demonstration activities | 2 | 2021 | 4 | 2025 |
| Radio frequency (RF) and optoelectronics (OE) demonstration activities for assurance | 2 | 2021 | 4 | 2025 |
| Qualify new SOTA and SOTP sources for RH electronics to demonstrate radiation hardened capabilities | 2 | 2021 | 4 | 2025 |
| Establish 2nd source for strategic radiation hardened by process (RHBP) state-of-the-practice (SOTP) partially depleted silicon on insulator source | 2 | 2021 | 4 | 2025 |
| Demonstrate new RF and optoelectronics (OE) microelectronics capabilities using secured design environments, advanced non-CMOS substrates, and optimized SOTA IP and test articles | 2 | 2021 | 4 | 2025 |
| Management/Technical Support | 2 | 2021 | 4 | 2025 |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 5: *System Development & Demonstration (SDD)* | **R-1 Program Element (Number/Name)**<br>PE 0605772D8Z / *Nuclear Command, Control and Communications (NC3)* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | - | 0.000 | 0.000 | 3.685 | - | 3.685 | 4.068 | 4.068 | 4.257 | 4.257 | Continuing | Continuing |
| 815: *Nuclear Command, Control and Communications (NC3)* | - | 0.000 | 0.000 | 3.685 | - | 3.685 | 4.068 | 4.068 | 4.257 | 4.257 | Continuing | Continuing |

**Note**

Nuclear Command, Control, and Communications (NC3) is not a new start. It is a continuation of efforts previously contained in PE 0604771D8Z, Joint Tactical Information Distribution System.

**A. Mission Description and Budget Item Justification**

This program supports the Under Secretary of Defense for Acquisition and Sustainment in her roles as the Principal Staff Assistant (PSA) for NC3 and NC3 Capability Portfolio Manager (CPM) as directed by the Secretary of Defense in the NC3 Governance Improvement (NGI) Implementation Plan. The NC3 Portfolio consists of ~200 systems, platforms, networks, and applications. The goals of the CPM are to 1) Accelerate NC3 modernization programs to deliver integrated cost-effective capabilities, 2) Maintain the readiness of operational NC3 systems and 3) Increase technology upgrades and prototyping to enable the future capabilities to outpace the threat. This program will develop the necessary tools and processes to assess integrated programmatic risk and to manage and oversee NC3 modernization and sustainment efforts. These tools include software, analytical expertise, and information storage and retrieval systems to support the continuing development of CPM for managing the complex NC3 enterprise. These efforts will simultaneously support the Commander, USSTRATCOM as NC3 Enterprise Lead and through the Director of the NC3 Enterprise Center (NEC); systems engineering and architecture development entities; the Under Secretary of Defense (USD) for Research and Engineering (R&E), the Joint Staff, and the Services. This program supports the capability portfolio-based approach (DoD Directive 7045.02, “Capability Portfolio Management”).

This program funds development of new tools, technical assessment and planning for the CPM to manage the NC3 enterprise. This includes:
1) developing and deploying software tools for improving NC3 enterprise-level management and programmatic risk assessment;
2) serving as the office of primary responsibility for NC3 enterprise capability portfolio management (to include assessing current capability, complying with statutory mandates, and conducting NC3-related studies, analysis, and policy updates);
3) assessing DoD Component plans, programs, and budgets for adequacy and execution (including course of action development and recommendations);
4) identifying, prototyping, evaluating, and recommending new technology for inclusion in the NC3 system;
5) supporting development of NC3 architecture updates and modernization aimed at system improvements;
6) developing NC3 corrective action and risk mitigation plans supported by senior investment decisions.
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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 5: *System Development & Demonstration (SDD)* | **R-1 Program Element (Number/Name)**<br>PE 0605772D8Z *I Nuclear Command, Control and Communications (NC3)* |

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 0.000 | 0.000 | 0.000 | - | 0.000 |
| Current President's Budget | 0.000 | 0.000 | 3.685 | - | 3.685 |
| Total Adjustments | 0.000 | 0.000 | 3.685 | - | 3.685 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | - | - | | | |
| • PE Creation - Funds moved from PE0604771D8Z | - | - | 3.689 | - | 3.689 |
| • Economic Assumption | - | - | -0.004 | - | -0.004 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 5 | R-1 Program Element (Number/Name)<br>PE 0605772D8Z / *Nuclear Command, Control and Communications (NC3)* | Project (Number/Name)<br>815 / *Nuclear Command, Control and Communications (NC3)* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 815: *Nuclear Command, Control and Communications (NC3)* | - | 0.000 | 0.000 | 3.685 | - | 3.685 | 4.068 | 4.068 | 4.257 | 4.257 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

This program supports development and operation of analytical tools to evaluate authoritative data (cost, schedule, performance, risk) on NC3 Portfolio programs to maximize portfolio alignment to strategic priorities and capabilities. It will create integrated development and delivery schedules for NC3 programs. These tools will forecast system/capability degradation as well as plans for capability replacement, improvement, or replacement in the context of the larger NC3 enterprise. It also provides the technical expertise to support risk management analysis (with an emphasis on system design, development and acquisition) of the NC3 enterprise and will develop strategies for synchronizing NC3 preplanned improvements. It will support the timely exchange of program and capability status information between elements of the NC3 enterprise, the OSD staff, and the combatant commands with a goal of increasing the use of electronic means to provide current and accurate information on key elements of the NC3 enterprise.

The effort will develop robust, integrated capability plans and schedules for NC3 capabilities to clarify system dependencies and identify disconnects. It will also support cross-department collaboration for development of enterprise-wide approaches for capability management. This includes: (1) vertical and horizontal integration activities within the Department and with the interagency where appropriate; (2) a coordinated portfolio-based approach to planning, programming, budgeting and execution; (3) reform efforts at the legislative, governance, policy, management and execution levels; 4) protection of information and technology that support or enables technology-based capability development for the NC3 warfighting domain and 5) supports the identification, evaluation, and incorporation of promising technology for inclusion in the NC3 system.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Nuclear Command, Control and Communications (NC3) | - | - | 3.685 |
| ***FY 2021 Plans:***<br>In the NC3 Capability Portfolio Manager (CPM) role, support the NC3 governance process by providing analysis to senior leadership bodies (NC3 Enterprise Review, Deputy's Management Action Group, SECDEF Weekly Priorities Review, etc.) and recommend investment and policy alternatives for decision.<br><br>Support the Under Secretary of Defense Acquisition and Sustainment as co-chair of the Council on Oversight of the National Leadership Command, Control, and Communications System (CONLC3S).<br>Conduct programmatic analysis to assess the NC3 portfolio of programs, systems, and facilities to identify cost, schedule, performance, and cyber security challenges. Work collaboratively with the NC3 Enterprise Center (NEC), Services, and DoD Agencies to develop strategies to correct deficiencies and speed modernization. | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0605772D8Z / *Nuclear Command, Control and Communications (NC3)* | **Project (Number/Name)**<br>815 / *Nuclear Command, Control and Communications (NC3)* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Conduct an annual Professional Staff Member Advisory Forum (i.e. Staffer Day) to keep congressional leadership informed on NC3 enterprise challenges and successes, seek assistance where appropriate, and build confidence in the DoD NC3 management and governance processes.<br><br>Work with the Under Secretary of Defense Research and Engineering to develop Science and Technology Strategic Plans to develop next generation NC3 capabilities and to ensure a viable path exists to transition technology to new or existing acquisition programs.<br><br>Develop NC3 Capability Planning Guidance linked to the National Defense Strategy and Commander U.S, Strategic Command priorities to inform Service POM builds and mitigate adjustments during the CAPE-led issue process.<br><br>Continue development of analytic tools, automated processes, and dashboards that allow data access and monitoring of the NC3 enterprise to identify programmatic issues early and implement corrective action.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funding moved from PE 0604771D8Z, Joint Tactical Information Distribution System to track capture funding profile of NC3 efforts. | | | |
| **Accomplishments/Planned Programs Subtotals** | - | - | 3.685 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Utilize existing fixed-price and cost-plus contracts (where appropriate) to continue implementation of NC3 Capability Portfolio Management, provide technical expertise for NC3 system evaluation and strategic planning, and development of NC3 analytical tools.

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0605772D8Z / *Nuclear Command, Control and Communications (NC3)* | **Project (Number/Name)**<br>815 / *Nuclear Command, Control and Communications (NC3)* |

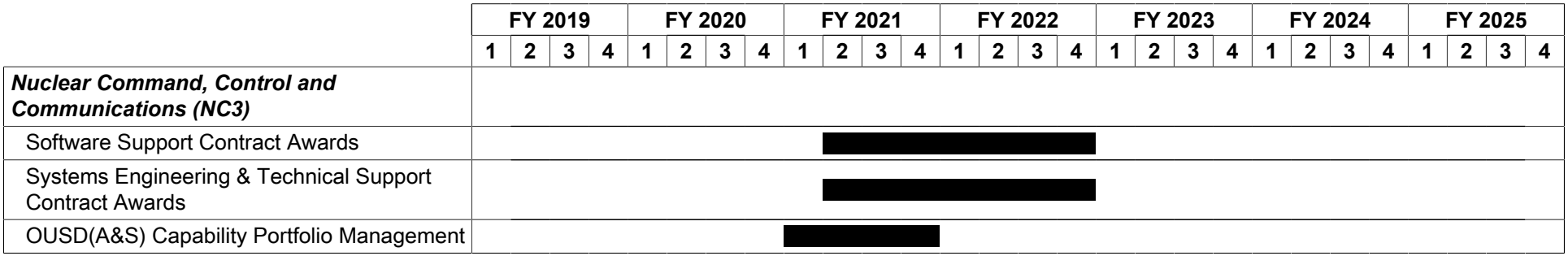
**Management Services ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NC3 Capability Portfolio Management | C/CPFF | OUSD(A&S)/ OASD(A)/ DASD(I&IPM): Pentagon : OUSD(A&S)/ OASD(A)/ DASD(I&IPM): Pentagon | - | - | | - | | 3.685 | Jan 2021 | - | | 3.685 | Continuing | Continuing | - |
| | | **Subtotal** | - | - | | - | | 3.685 | | - | | 3.685 | Continuing | Continuing | N/A |

| | Prior Years | FY 2019 | | FY 2020 | | FY 2021 Base | | FY 2021 OCO | | FY 2021 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | - | - | | 0.000 | | 3.685 | | - | | 3.685 | Continuing | Continuing | N/A |

**Remarks**

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0605772D8Z / *Nuclear Command, Control and Communications (NC3)* | **Project (Number/Name)**<br>815 / *Nuclear Command, Control and Communications (NC3)* |



| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0605772D8Z / *Nuclear Command, Control and Communications (NC3)* | **Project (Number/Name)**<br>815 / *Nuclear Command, Control and Communications (NC3)* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***Nuclear Command, Control and Communications (NC3)*** | | | | |
| Software Support Contract Awards | 2 | 2021 | 4 | 2022 |
| Systems Engineering & Technical Support Contract Awards | 2 | 2021 | 4 | 2022 |
| OUSD(A&S) Capability Portfolio Management | 1 | 2021 | 4 | 2021 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 5: *System Development & Demonstration (SDD)* | **R-1 Program Element (Number/Name)**<br>PE 0305304D8Z / *DoD Enterprise Energy Information Management (EEIM)* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 11.527 | 2.391 | 4.373 | 3.275 | - | 3.275 | 2.601 | 2.857 | 2.969 | 3.189 | Continuing | Continuing |
| 305: *Real Property Accountability* | 9.841 | 2.161 | 3.052 | 1.954 | - | 1.954 | 1.280 | 1.536 | 1.648 | 1.868 | Continuing | Continuing |
| 306: *DoD Siting Clearinghouse* | 1.686 | 0.000 | 0.349 | 0.349 | - | 0.349 | 0.349 | 0.349 | 0.349 | 0.349 | Continuing | Continuing |
| 307: *Cyber Security* | 0.000 | 0.205 | 0.972 | 0.972 | - | 0.972 | 0.972 | 0.972 | 0.972 | 0.972 | Continuing | Continuing |
| 304: *DoD Enterprise Information* | 0.000 | 0.025 | 0.000 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

The Program Element (PE) 0305304D8Z was established in FY 2013 supporting the Department's goals for audit readiness, energy efficiency, Real Property accountability, and to improve data quality and integration across the full spectrum of Sustainment business functions. The PE is used to conduct Business Process Re-engineering activities, developing and publishing data standards, and to build out data stores and portal requirements for Energy Resiliency and Conservation Investment Program (ERCIP) management. Funding is also used to support ASD Sustainment Senior Real Property Officer accountability requirements such as reconciliation of enterprise real property inventory records and development of asset management processes, business rules and associated data standards. A major component of this effort is fielding an enterprise Data Analytics & Integration Support (DAIS) platform coupled with an independent verification & validation capability, providing access to real time data through Web Services Description Language (WSDL) in support of timely, data-driven decision-making.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 2.429 | 4.373 | 4.157 | - | 4.157 |
| Current President's Budget | 2.391 | 4.373 | 3.275 | - | 3.275 |
| Total Adjustments | -0.038 | 0.000 | -0.882 | - | -0.882 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | -0.038 | - | | | |
| • SBIR/STTR Transfer | - | - | | | |
| • Other Program Adjustment | - | - | -0.304 | - | -0.304 |
| • Economic Assumption | - | - | -0.004 | - | -0.004 |
| • Defense Wide Review Adjustment | - | - | -0.574 | - | -0.574 |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 5: *System Development & Demonstration (SDD)* | **R-1 Program Element (Number/Name)**<br>PE 0305304D8Z / *DoD Enterprise Energy Information Management (EEIM)* |

| Congressional Add Details ($ in Millions, and Includes General Reductions) | FY 2019 | FY 2020 |
|---|---|---|
| **Project:** 304: *DoD Enterprise Information* | | |
| Congressional Add: *None* | 0.000 | 0.000 |
| Congressional Add Subtotals for Project: 304 | 0.000 | 0.000 |
| Congressional Add Totals for all Projects | 0.000 | 0.000 |

**Change Summary Explanation**

The decrease of $0.304 million is the result of planned program changes in OUSD(A&S).

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 5 | R-1 Program Element (Number/Name)<br>PE 0305304D8Z / *DoD Enterprise Energy Information Management (EEIM)* | Project (Number/Name)<br>305 / *Real Property Accountability* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 305: *Real Property Accountability* | 9.841 | 2.161 | 3.052 | 1.954 | - | 1.954 | 1.280 | 1.536 | 1.648 | 1.868 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

The Real Property Inventory fulfills requirements of Executive Orders to achieve and maintain real property accountability and is a key component supporting both audit readiness and life-cycle asset management activities. This funding provides the department independent verification and validation needed to reconcile data errors, promoting improved data quality and facilitating interoperability with Service systems to provide an enterprise view of asset management across the real property lifecycle from acquisition to disposal. Oversight and configuration management of business rules and standards are used to determine requirements, manage inventory records, and improve business processes. This initiative includes development and procurement of the enterprise data warehouse for integrating existing and future Sustainment systems and database needs. The required Real Property Unique Identifier (RPUID) process is included in this enterprise system.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Real Property Accountability | 2.161 | 3.052 | 1.954 |
| ***Description:*** The ASD Sustainment is the Senior Real Property Officer for DoD, responsible for accountability and utilization of all DoD Real Property Assets. This funding provides the department an enterprise data warehouse coupled with an independent verification & validation capability. The DoD Real Property Accountability efforts are mandated by Executive Order and Public Law for improved reporting and utilization of federal real property, and to support data-driven decisions. | | | |
| ***FY 2020 Plans:***<br>Support reconciliation and audit corrective action plan efforts by identifying errors/inconsistencies in Real Property inventory records, asset accountability and management processes, and business rules and associated data. Continue Data Analytics & Integration Support (DAIS) platform and Web Services Description Language (WSDL) implementation to improve data quality supporting multiple analyses. | | | |
| ***FY 2021 Plans:***<br>Continue to support reconciliation and audit corrective action plan efforts by identifying errors/inconsistencies in Real Property inventory records, asset accountability and management processes, and business rules and associated data. Continue Data Analytics & Integration Support (DAIS) platform and Web Services Description Language (WSDL) implementation to improve data quality supporting multiple analyses | | | |
| ***FY 2020 to FY 2021 Increase/Decrease Statement:*** | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0305304D8Z / *DoD Enterprise Energy Information Management (EEIM)* | **Project (Number/Name)**<br>305 / *Real Property Accountability* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| The decrease of $1.098 million is the result of planned program changes in OUSD(A&S). | | | |
| **Accomplishments/Planned Programs Subtotals** | 2.161 | 3.052 | 1.954 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Program utilizes Washington Headquarters Services Acquisition Directorate for EEIM contract support requirements.

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0305304D8Z / *DoD Enterprise Energy Information Management (EEIM)* | **Project (Number/Name)**<br>305 / *Real Property Accountability* | |

**Product Development ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EI&E Data Analytics & Integration Platform | C/FFP | FTC : Herndon VA | 0.788 | 0.775 | Mar 2019 | 0.815 | Mar 2020 | 0.752 | Mar 2021 | - | | 0.752 | Continuing | Continuing | - |
| | | **Subtotal** | 0.788 | 0.775 | | 0.815 | | 0.752 | | - | | 0.752 | Continuing | Continuing | N/A |

**Remarks**

NA

**Support ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BSI Support Contract Extension | C/FFP | ANSER : Mark Center | 8.310 | 0.600 | Apr 2019 | - | | - | | - | | - | Continuing | Continuing | - |
| Defense Installation Spatial Data Infrastructure (DISDI) IGI&S Portal | MIPR | USACE : CRREL | 0.743 | 0.205 | May 2019 | 0.350 | May 2020 | 0.202 | May 2021 | - | | 0.202 | Continuing | Continuing | - |
| BSI Support Contract Re-compete (7 Month Base) | C/FFP | TBD : Mark Center | - | 0.581 | Sep 2019 | 1.887 | Apr 2020 | 1.000 | Apr 2021 | - | | 1.000 | Continuing | Continuing | - |
| | | **Subtotal** | 9.053 | 1.386 | | 2.237 | | 1.202 | | - | | 1.202 | Continuing | Continuing | N/A |

**Remarks**

NA

| | Prior Years | FY 2019 | | FY 2020 | | FY 2021 Base | | FY 2021 OCO | | FY 2021 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | 9.841 | 2.161 | | 3.052 | | 1.954 | | - | | 1.954 | Continuing | Continuing | N/A |

**Remarks**

NA

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0305304D8Z / *DoD Enterprise Energy Information Management (EEIM)* | **Project (Number/Name)**<br>305 / *Real Property Accountability* |

| ID | Task Name | Start | Finish |
|---|---|---|---|
| 1 | EI&E DBS PfM Reviews | 10/01/18 | continuous |
| 2 | Develop FY-19 BEA Artifacts | 01/01/18 | 09/30/19 |
| 3 | RPIM Updates | 11/01/18 | 11/30/20 |
| 4 | EI&E BPR | 10/01/18 | 03/20/20 |
| 5 | IV&V | 10/01/18 | continuous |
| 6 | EI&E Processes Auditability | 10/01/18 | 09/30/19 |
| 7 | EI&E Data Analytics & Integrat | 10/01/19 | 09/30/20 |
| 8 | DISDI IGI&S Portal | 10/01/19 | 09/30/20 |

| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0305304D8Z / *DoD Enterprise Energy Information Management (EEIM)* | **Project (Number/Name)**<br>305 / *Real Property Accountability* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***PfM*** | | | | |
| Sustainment DBS PfM Reviews | 1 | 2019 | 4 | 2021 |
| Develop BEA Artifacts | 2 | 2019 | 4 | 2020 |
| ***Real Property Asset Management*** | | | | |
| RPIM Updates | 1 | 2018 | 1 | 2021 |
| Sustainment BPR | 4 | 2018 | 2 | 2020 |
| IV&V | 1 | 2018 | 4 | 2021 |
| Sustainment Process & System Auditability | 4 | 2018 | 4 | 2020 |
| Sustainment Data Analytics & Integration | 1 | 2019 | 4 | 2021 |
| DISDI IGI&S Portal | 1 | 2020 | 4 | 2021 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 5 | R-1 Program Element (Number/Name)<br>PE 0305304D8Z / *DoD Enterprise Energy Information Management (EEIM)* | Project (Number/Name)<br>306 / *DoD Siting Clearinghouse* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 306: *DoD Siting Clearinghouse* | 1.686 | 0.000 | 0.349 | 0.349 | - | 0.349 | 0.349 | 0.349 | 0.349 | 0.349 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

The DoD Siting Clearinghouse is charged by statute to identify technical mitigation measures necessary to overcome degradation of radar from the proliferation of industrial wind turbine development. This R&D is necessary to work with Federally Funded Research and Development Centers (FFRDCs) to study potential technical improvements to radar.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** DoD Siting Clearinghouse | 0.000 | 0.349 | 0.349 |
| ***Description:*** The DoD Siting Clearinghouse works with FFRDCs to identify technical mitigation measures necessary to overcome degradation of radar from the proliferation of industrial wind turbine development. This R&D is necessary to study potential technical improvements to radar.<br><br>***FY 2020 Plans:***<br>Continue to support radar studies as planned through the Wind Turbine Interference Mitigation Forum.<br><br>***FY 2021 Plans:***<br>Continue to support radar studies as planned through the Wind Turbine Interference Mitigation Forum. | | | |
| **Accomplishments/Planned Programs Subtotals** | 0.000 | 0.349 | 0.349 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

The Clearinghouse will work this through existing efforts with FFRDCs.

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 5 | R-1 Program Element (Number/Name)<br>PE 0305304D8Z / *DoD Enterprise Energy Information Management (EEIM)* | Project (Number/Name)<br>306 / *DoD Siting Clearinghouse* | |

**Test and Evaluation ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coordinate Tech Studies of to overcome Impacts to Radar | FFRDC | TBD : TBD | 1.686 | 0.000 | Jan 2019 | 0.349 | Jan 2020 | 0.349 | Jan 2021 | - | | 0.349 | Continuing | Continuing | - |
| | | **Subtotal** | 1.686 | 0.000 | | 0.349 | | 0.349 | | - | | 0.349 | Continuing | Continuing | N/A |

**Remarks**

NA

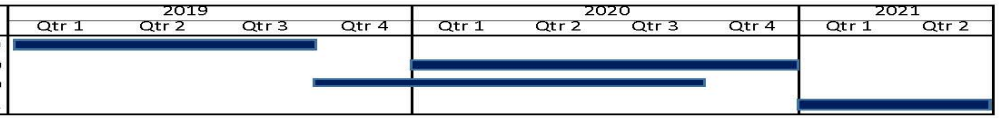
| | Prior Years | FY 2019 | | FY 2020 | | FY 2021 Base | | FY 2021 OCO | | FY 2021 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | 1.686 | 0.000 | | 0.349 | | 0.349 | | - | | 0.349 | Continuing | Continuing | N/A |

**Remarks**

NA

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0305304D8Z / *DoD Enterprise Energy Information Management (EEIM)* | **Project (Number/Name)**<br>306 / *DoD Siting Clearinghouse* |

| ID | Task Name | Start | Finish |
|---|---|---|---|
| 2 | Develop FY-20 Program | 10/01/18 | 06/30/19 |
| 3 | FY-20 Study Eval | 01/01/20 | 09/31/20 |
| 4 | Develop FY-21 Program | 10/01/19 | 06/30/20 |
| 3 | FY-21 Study Eval | 01/01/21 | 03/31/21 |



| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0305304D8Z / *DoD Enterprise Energy Information Management (EEIM)* | **Project (Number/Name)**<br>306 / *DoD Siting Clearinghouse* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***DoD Siting Clearinghouse*** | | | | |
| Develop FY 2020 Program | 1 | 2019 | 4 | 2019 |
| FY 2020 Study Eval | 1 | 2020 | 4 | 2020 |
| Develop FY 2021 Program | 4 | 2019 | 3 | 2020 |
| FY 2021 Study Evaluation | 1 | 2021 | 4 | 2021 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 5 | R-1 Program Element (Number/Name)<br>PE 0305304D8Z / *DoD Enterprise Energy Information Management (EEIM)* | Project (Number/Name)<br>307 / *Cyber Security* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 307: *Cyber Security* | 0.000 | 0.205 | 0.972 | 0.972 | - | 0.972 | 0.972 | 0.972 | 0.972 | 0.972 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

The current state of cyber security of energy-related (and other real property-related) control systems (such as the electronic/computer controls on heating, ventilation & air conditioning equipment) is deficient, and the adjusted EEIM baseline supports a multi-year real property-related control systems cyber security initiative to address these issues.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Cyber Security | 0.205 | 0.972 | 0.972 |
| ***Description:*** The current state of cyber security of energy-related (and other real property-related) control systems (such as the electronic/computer controls on heating, ventilation & air conditioning equipment) is deficient. This effort supports a multi-year real property-related control systems cyber security initiative to address these issues. So far it has generated an updated DoD CIO RMF Knowledge Service Portal with controls systems cyber security implementation guidance for practitioners (templates, key references, step-by-step instructions, look-up tables, etc.)<br>Controls systems cyber security Tactics, Techniques and Procedures (TTPS) has transitioned from Joint Base Architecture for Secure Industrial Control Systems (J-BASICS). The department is implementing Platform Resilience Mission Assurance (PRMA) assessments across ten installations.<br>This effort has also generated policy direction to Services and Agencies including a draft Department of Defense Instruction, a draft Department of Defense Manual and Security Handling Guide for data representing energy systems.<br><br>***FY 2020 Plans:***<br>Continue to support multiyear real property-related controls systems cyber security risk assessments and development of guidelines and training manuals for future in house procedures.<br><br>***FY 2021 Plans:***<br>Continue to support multiyear real property-related controls systems cyber security risk assessments and development of guidelines and training manuals for future in house procedures. Finalize DoD actions supporting the joint initiative with DOE this year. | | | |
| **Accomplishments/Planned Programs Subtotals** | 0.205 | 0.972 | 0.972 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0305304D8Z / *DoD Enterprise Energy Information Management (EEIM)* | **Project (Number/Name)**<br>307 / *Cyber Security* |

**C. Other Program Funding Summary ($ in Millions)**

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0305304D8Z / *DoD Enterprise Energy Information Management (EEIM)* | **Project (Number/Name)**<br>307 / *Cyber Security* |

**Test and Evaluation ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Platform Resilience Mission Assurance (PRMA) | MIPR | ARMAMENT RDEC : BLDG 91 4TH AVE, PICATINNY ARSENAL NJ 07806-5000 | - | 0.205 | Jan 2019 | 0.972 | May 2020 | 0.972 | May 2021 | - | | 0.972 | Continuing | Continuing | - |
| | | **Subtotal** | - | 0.205 | | 0.972 | | 0.972 | | - | | 0.972 | Continuing | Continuing | N/A |

**Remarks**

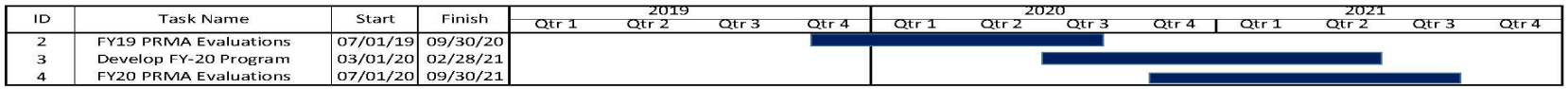
NA

| | Prior Years | FY 2019 | | FY 2020 | | FY 2021 Base | | FY 2021 OCO | | FY 2021 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | - | 0.205 | | 0.972 | | 0.972 | | - | | 0.972 | Continuing | Continuing | N/A |

**Remarks**

NA

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0305304D8Z / *DoD Enterprise Energy Information Management (EEIM)* | **Project (Number/Name)**<br>307 / *Cyber Security* |



| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0305304D8Z / *DoD Enterprise Energy Information Management (EEIM)* | **Project (Number/Name)**<br>307 / *Cyber Security* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***DoD Facility Related Controls Cyber Security Risk Assessment*** | | | | |
| FY 2019 PRMA Evaluations | 4 | 2019 | 3 | 2020 |
| Develop FY 2020 Program | 2 | 2020 | 2 | 2021 |
| FY 2020 PRMA Evaluations | 4 | 2020 | 4 | 2021 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 5 | R-1 Program Element (Number/Name)<br>PE 0305304D8Z / *DoD Enterprise Energy Information Management (EEIM)* | Project (Number/Name)<br>304 / *DoD Enterprise Information* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 304: *DoD Enterprise Information* | 0.000 | 0.025 | 0.000 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**Note**

304 has been reprogrammed into 305 to allow more efficient contracting actions. The same contracted staff perform the combined functions funded by both P-Codes.

**A. Mission Description and Budget Item Justification**

Supports Integration of multiple information data sources with accurate Real property asset, Utilization, Military Construction, Environmental, and installation Geospatial data. This is equally key to ensuring Sustainment decisions for planning and reporting are possible. Also supports development and modification of the geospatial portal and Atlas Pro for visualizing
Sustainment data on installation or area maps for improved spatial analysis and reconciliation. This portal is the DOD aggregated repository for DoD Common Installation Picture layers. Additionally, the map viewer is customized and easier for OSD senior staff to manipulate and includes an online catalog of maps, documents and data; and a secure, robust data exchange module. This development supports a range of Joint Staff and OSD customers.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Funding moved to P-Code 305 for more efficient contracting actions supporting.<br>***Description:*** Combined P-Code 304 funding with P-Code 305 to improve contracting options. For accomplishments see P-Code 305. | 0.025 | - | - |
| **Accomplishments/Planned Programs Subtotals** | 0.025 | - | - |

| | FY 2019 | FY 2020 |
|---|---|---|
| ***Congressional Add:*** None<br>***FY 2019 Accomplishments:*** See P-Code 305 Accomplishments.<br>***FY 2020 Plans:*** See P-Code 305 FY2020 Plans. | 0.000 | 0.000 |
| **Congressional Adds Subtotals** | 0.000 | 0.000 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0305304D8Z / *DoD Enterprise Energy Information Management (EEIM)* | **Project (Number/Name)**<br>304 / *DoD Enterprise Information* |

**D. Acquisition Strategy**

N/A

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0305304D8Z / *DoD Enterprise Energy Information Management (EEIM)* | **Project (Number/Name)**<br>304 / *DoD Enterprise Information* |

**Remarks**

P-Code 304 funding combined with P-Code 305 for more efficient contracting action since same contract supports both requirements.

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0305304D8Z / *DoD Enterprise Energy Information Management (EEIM)* | **Project (Number/Name)**<br>304 / *DoD Enterprise Information* |

| | FY 2019 | | | | FY 2020 | | | | FY 2021 | | | | FY 2022 | | | | FY 2023 | | | | FY 2024 | | | | FY 2025 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| ***Schedule detail available in R-4 for 305*** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Schedule detail available in R-4 for P-Code 305. | | | | | | | | | | | | | [redacted] | | | | | | | | | | | | | | | |

| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0305304D8Z / *DoD Enterprise Energy Information Management (EEIM)* | **Project (Number/Name)**<br>304 / *DoD Enterprise Information* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***Schedule detail available in R-4 for 305*** | | | | |
| Schedule detail available in R-4 for P-Code 305. | 4 | 2020 | 3 | 2022 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 5: *System Development & Demonstration (SDD)* | **R-1 Program Element (Number/Name)**<br>PE 0305310D8Z / *CWMD Systems: System Development & Demonstration* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 8.214 | 16.385 | 12.854 | 20.585 | - | 20.585 | 20.859 | 21.447 | 21.904 | 22.144 | Continuing | Continuing |
| 813: *CWMD Systems: System Development & Demonstration* | 8.214 | 16.385 | 12.854 | 20.585 | - | 20.585 | 20.859 | 21.447 | 21.904 | 22.144 | Continuing | Continuing |

**Note**

Increase from FY 2020 to FY 2021 is the result of redistribution of funding from Countering Weapons of Mass Destruction (CWMD) Systems: Advanced Technology Development (PE# 0303310D8Z) to CWMD Systems: System Development and Demonstration (PE# 0305310D8Z) and CWMD Systems: Operational Systems Development (PE# 0607310D8Z). This redistribution supports the Department's need to prioritize investment in fieldable capabilities to enhance Joint Force lethality in countering WMD proliferation and use.

**A. Mission Description and Budget Item Justification**

The Countering Weapons of Mass Destruction (CWMD) Systems portfolio aligns with the National Defense Strategy objective of "dissuading, preventing, or deterring state adversaries and non-state actors from acquiring, proliferating, or using weapons of mass destruction."

The CWMD Systems portfolio enhances warfighter lethality by developing capabilities to analyze and exploit critical nodes of nuclear, chemical, and biological weapons and ballistic missile programs and proliferation networks; and developing offensively-oriented capabilities to disrupt WMD proliferation networks and detect, disable, or defeat WMD and delivery systems. Investments result in capabilities fielded to the Joint Force, enabling it to reduce WMD threats and create options for the United States to prevent WMD use.

The Office of the Secretary of Defense uses the CWMD Systems portfolio to invest strategically in projects across the Military Services, Combatant Commands, and Defense Agencies. Funding is prioritized for projects that close Joint Force warfighter capability gaps. An annual investment strategy is used to meet emergent operational and capability needs submitted by the Joint Force, yielding new fielded capabilities within one to two years.

The CWMD Systems: Systems Development and Demonstration program invests in maturation of prototypes; integration of technologies, systems and components; developmental and operational test and evaluation; and transition to fielded capabilities that counter WMD proliferation. This program accelerates and enables transition of mature technologies to fielded capabilities by leveraging significant science and technology (S&T) investments made by the Department of Defense, other Federal agencies, and industry. Fielded capabilities illuminate WMD networks; exploit vulnerabilities in networks, programs, facilities, and weapons systems; and disable or defeat WMD.

This appropriation funds labor, materials, and travel to support the requirements of this program, performed by a government agency or by private individuals or organizations under a contract with the government, for activities and acquisitions including RDT&E, assessments and analyses, research studies, education, and other activities related to capability development and fielding.

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 5: *System Development & Demonstration (SDD)* | **R-1 Program Element (Number/Name)**<br>PE 0305310D8Z *I CWMD Systems: System Development & Demonstration* |

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 17.009 | 12.854 | 13.320 | - | 13.320 |
| Current President's Budget | 16.385 | 12.854 | 20.585 | - | 20.585 |
| Total Adjustments | -0.624 | 0.000 | 7.265 | - | 7.265 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | -0.621 | - | | | |
| • Transfer from other CWMD System PEs | - | - | 8.888 | - | 8.888 |
| • Cancelled Acct | -0.003 | - | - | - | - |
| • Economic Assumption | - | - | -0.023 | - | -0.023 |
| • Defense Wide Review Adjustment | - | - | -1.600 | - | -1.600 |

**Change Summary Explanation**

Increase from FY 2020 to FY 2021 is the result of redistribution of funding from Countering Weapons of Mass Destruction (CWMD) Systems: Advanced Technology Development (PE# 0303310D8Z) to CWMD Systems: System Development and Demonstration (PE# 0305310D8Z) and CWMD Systems: Operational Systems Development (PE# 0607310D8Z). This redistribution supports the Department’s need to prioritize investment in fieldable capabilities to enhance Joint Force lethality in countering WMD proliferation and use.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 5 | R-1 Program Element (Number/Name)<br>PE 0305310D8Z / *CWMD Systems: System Development & Demonstration* | Project (Number/Name)<br>813 / *CWMD Systems: System Development & Demonstration* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 813: *CWMD Systems: System Development & Demonstration* | 8.214 | 16.385 | 12.854 | 20.585 | - | 20.585 | 20.859 | 21.447 | 21.904 | 22.144 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**Note**

Increase from FY 2020 to FY 2021 is the result of redistribution of funding from Countering Weapons of Mass Destruction (CWMD) Systems: Advanced Technology Development (PE# 0303310D8Z) to CWMD Systems: System Development and Demonstration (PE# 0305310D8Z) and CWMD Systems: Operational Systems Development (PE# 0607310D8Z). This redistribution supports the Department's need to prioritize investment in fieldable capabilities to enhance Joint Force lethality in countering WMD proliferation and use.

**A. Mission Description and Budget Item Justification**

The Countering Weapons of Mass Destruction (CWMD) Systems portfolio aligns with the National Defense Strategy objective of "dissuading, preventing, or deterring state adversaries and non-state actors from acquiring, proliferating, or using weapons of mass destruction."

The CWMD Systems portfolio enhances warfighter lethality by developing capabilities to analyze and exploit critical nodes of nuclear, chemical, and biological weapons and ballistic missile programs and proliferation networks; and developing clandestine, offensively-oriented capabilities to disrupt WMD proliferation networks and detect, disable, or defeat WMD and delivery systems. Investments result in capabilities fielded to the Joint Force, enabling it to reduce WMD threats and create options for the United States to prevent WMD use.

The Office of the Secretary of Defense uses the CWMD Systems portfolio to invest strategically in projects across the Military Services, Combatant Commands, and Defense Agencies. Funding is prioritized for projects that close Joint Force warfighter capability gaps. An annual investment strategy is used to meet emergent operational and capability needs submitted by the Joint Force, yielding new fielded capabilities within one to two years.

The CWMD Systems: Systems Development and Demonstration program invests in maturation of prototypes; integration of technologies, systems and components; developmental and operational test and evaluation; and transition to fielded capabilities that counter WMD proliferation. This program accelerates and enables transition of mature technologies to fielded capabilities by leveraging significant science and technology (S&T) investments made by the Department of Defense, other Federal agencies, and industry. Fielded capabilities illuminate WMD networks; exploit vulnerabilities in networks, programs, facilities, and weapons systems; and disable or defeat WMD.

This appropriation funds labor, materials, and travel to support the requirements of this program, performed by a government agency or by private individuals or organizations under a contract with the government, for activities and acquisitions including RDT&E, assessments and analyses, research studies, education, and other activities related to capability development and fielding.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0305310D8Z / *CWMD Systems: System Development & Demonstration* | **Project (Number/Name)**<br>813 / *CWMD Systems: System Development & Demonstration* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** P*813 / CWMD Systems: System Development & Demonstration | 16.385 | 12.854 | 20.585 |
| ***Description:*** The CWMD Systems: Systems Development and Demonstration program invests in maturation of prototypes; integration of technologies, systems and components; developmental and operational test and evaluation; and transition to fielded capabilities that counter WMD proliferation. Significant science and technology (S&T) investments in prototype development by the Department of Defense, other Federal agencies, and industry are leveraged, capitalizing on mature technologies to accelerate and enable transition to fielded capabilities. Fielded capabilities illuminate WMD networks; exploit vulnerabilities in networks, programs, facilities, and weapons systems; and disable or defeat WMD.<br><br>***FY 2020 Plans:***<br>• Transitioned six prototypes into fielded capabilities, providing significant improvements to the capability of Special Operations Forces to operate in WMD environments and counter WMD threats<br>• Matured, integrated, and fielded technologies under a number of classified projects to enable new capabilities to detect, disrupt, and defeat WMD and WMD networks<br>• Completed and transitioned 88% of technology projects to fielded capabilities<br><br>***FY 2021 Plans:***<br>• Transition hand-held alpha-beta particle monitor device to the Joint Program Executive Office for Chemical, Biological, Radiological, and Nuclear Defense (JPEO CBRND) for integration and procurement, supporting U.S. Marine Corps Explosive Ordnance Disposal units.<br>• Continue maturation of prototypes, systems, and components for test and evaluation by end-users and transition to fieldable capabilities.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Increase from FY 2020 to FY 2021 is the result of redistribution of funding from Countering Weapons of Mass Destruction (CWMD) Systems: Advanced Technology Development (PE# 0303310D8Z) to CWMD Systems: System Development and Demonstration (PE# 0305310D8Z) and CWMD Systems: Operational Systems Development (PE# 0607310D8Z). This redistribution supports the Department's need to prioritize investment in fieldable capabilities to enhance Joint Force lethality in countering WMD proliferation and use. | | | |
| **Accomplishments/Planned Programs Subtotals** | 16.385 | 12.854 | 20.585 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0305310D8Z / *CWMD Systems: System Development & Demonstration* | **Project (Number/Name)**<br>813 / *CWMD Systems: System Development & Demonstration* |

**C. Other Program Funding Summary ($ in Millions)**

**Remarks**

N/A

**D. Acquisition Strategy**

The Office of the Deputy Assistant Secretary of Defense for Threat Reduction and Arms Control (TRAC) establishes annual priorities based on national and DoD strategies and senior leader guidance. Based on those priorities, TRAC solicits project proposals from Combatant Commands, Military Services, and Defense Agencies, and interagency partners. To be selected, a proposed project must have a validated requirement, an engaged requirement champion, a viable acquisition strategy, and a qualified program management office. A technology project must identify its starting and desired end-state Technology Readiness Level. Likewise, the end-user for any proposed project must demonstrate a long-term plan for acceptance and sustainment of a fieldable capability. Project period of performance is typically 12-18 months.

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0305310D8Z / *CWMD Systems: System Development & Demonstration* | **Project (Number/Name)**<br>813 / *CWMD Systems: System Development & Demonstration* |

**Product Development ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Engineering & manufacturing development of information systems & components | C/T&M | TBD : TBD | 4.107 | 8.193 | Jan 2020 | 6.427 | Jan 2021 | 10.293 | Jan 2022 | - | | 10.293 | Continuing | Continuing | - |
| Systems development & demonstration, and initial operational test & evaluation | C/T&M | TBD : TBD | 3.286 | 6.553 | Jan 2020 | 5.142 | Jan 2021 | 7.706 | Jan 2022 | - | | 7.706 | Continuing | Continuing | - |
| Program management support | C/T&M | TBD : TBD | 0.821 | 1.639 | Jan 2020 | 1.285 | Jan 2021 | 2.586 | Jan 2022 | - | | 2.586 | Continuing | Continuing | - |
| | | **Subtotal** | 8.214 | 16.385 | | 12.854 | | 20.585 | | - | | 20.585 | Continuing | Continuing | N/A |

**Remarks**

N/A

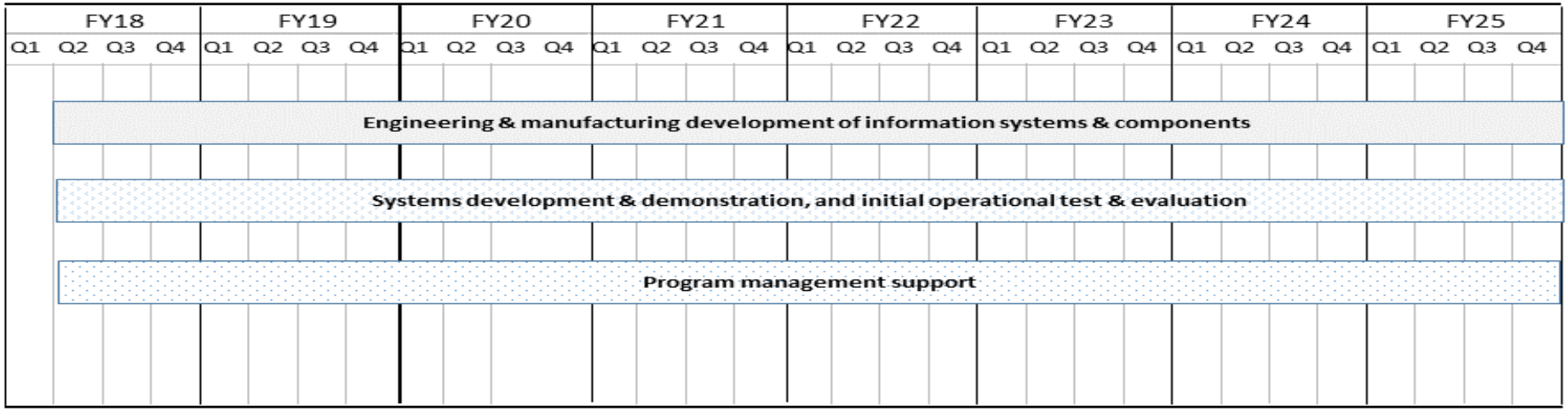
| | Prior Years | FY 2019 | | FY 2020 | | FY 2021 Base | | FY 2021 OCO | | FY 2021 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | 8.214 | 16.385 | | 12.854 | | 20.585 | | - | | 20.585 | Continuing | Continuing | N/A |

**Remarks**

NA

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0305310D8Z / *CWMD Systems: System Development & Demonstration* | **Project (Number/Name)**<br>813 / *CWMD Systems: System Development & Demonstration* |

**CWMD Systems: System Development & Demonstration**
**BA 5 / PE 0305310D8Z**



| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0305310D8Z / *CWMD Systems: System Development & Demonstration* | **Project (Number/Name)**<br>813 / *CWMD Systems: System Development & Demonstration* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***Engineering & Manufacturing Development*** | | | | |
| Develop information systems & components | 2 | 2021 | 4 | 2025 |
| ***Operational Test & Evaluation*** | | | | |
| Perform initial operational Test & Evaluation (T&E) | 2 | 2021 | 4 | 2025 |
| ***Program Management Support*** | | | | |
| Provide Program Management (PM) support for development and Test and Evaluation (T&E) | 2 | 2021 | 4 | 2025 |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support* | **R-1 Program Element (Number/Name)**<br>PE 0604774D8Z / *Defense Readiness Reporting System (DRRS)* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 41.555 | 6.606 | 9.724 | 9.793 | - | 9.793 | 9.858 | 9.925 | 9.925 | 10.124 | Continuing | Continuing |
| 774: *Defense Readiness Reporting System (DRRS)* | 41.555 | 6.606 | 9.724 | 9.793 | - | 9.793 | 9.858 | 9.925 | 9.925 | 10.124 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

This funding supports the Defense Readiness Reporting System - Strategic, (DRRS-S,) the comprehensive readiness reporting system for the Department of Defense mandated under Title 10 U.S. Code. The system measures in an objective, accurate, and timely manner the capability of the armed forces to carry out the National Security Strategy prescribed by the President, as well as the defense planning guidance provided by the Secretary of Defense and the National Military Strategy prescribed by the Chairman of the Joint Chiefs of Staff. DRRS-S hosts information and applications used to support the Geographic and Functional Combatant Commanders, the Services, Combat Support Agencies, the Joint Staff and the Office of the Secretary of Defense.

DRRS-S is the evolution of readiness reporting to a more comprehensive system, better able to meet the Department's current and future readiness information challenges. Included in these challenges is the expansion in scope of the entities who can, and do report readiness, as well as what they report. Shifting from solely resource centric readiness reporting to a resource informed mission/capabilities based reporting system, oriented towards the National Military Strategy (NMS), makes substantially more complex demands on readiness reporting, but portrays a far more relevant and holistic picture of readiness. DRRS-S allows the Department to assess readiness globally based on the program's integrated ability to project and sustain a mix of constructed forces in simultaneous engagements. Additionally, the challenges associated with sourcing and evaluating the readiness of our forces engaged in on-going real operations mean that force managers need applications that will query the entire Department for suitable, available organizations to meet current needs. DRRS-S continues to incorporate more data, and develop more capable functionality to meet the needs of both the operational employers of the Force, but also those responsible for Force Generation.

FY2019 NDAA made revisions to Title 10 U.S. Code and provided the Department of Defense direction requiring growth in the DRRS-S program and identified the program's need to maintain the technical currency necessary to quickly meet future challenges associated with providing senior leaders with relevant and timely information. Such initiatives include implementing the complex data structures and visualization tools needed to operationalize the Global Force Management - Data Initiative, and reporting at lower organizational levels consistent with how Forces are actually employed.

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support* | **R-1 Program Element (Number/Name)**<br>PE 0604774D8Z / *Defense Readiness Reporting System (DRRS)* |

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 6.607 | 9.724 | 9.793 | - | 9.793 |
| Current President's Budget | 6.606 | 9.724 | 9.793 | - | 9.793 |
| Total Adjustments | -0.001 | 0.000 | 0.000 | - | 0.000 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | -0.001 | - | | | |
| • SBIR/STTR Transfer | - | - | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 6 | R-1 Program Element (Number/Name)<br>PE 0604774D8Z / *Defense Readiness Reporting System (DRRS)* | Project (Number/Name)<br>774 / *Defense Readiness Reporting System (DRRS)* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 774: *Defense Readiness Reporting System (DRRS)* | 41.555 | 6.606 | 9.724 | 9.793 | - | 9.793 | 9.858 | 9.925 | 9.925 | 10.124 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

This funding supports the Defense Readiness Reporting System - Strategic, (DRRS-S,) the comprehensive readiness reporting system for the Department of Defense mandated under Title 10 U.S. Code. The system measures in an objective, accurate, and timely manner the capability of the armed forces to carry out the National Security Strategy prescribed by the President, as well as the defense planning guidance provided by the Secretary of Defense and the National Military Strategy prescribed by the Chairman of the Joint Chiefs of Staff. DRRS-S hosts information and applications used to support the Geographic and Functional Combatant Commanders, the Services, Combat Support Agencies, the Joint Staff and the Office of the Secretary of Defense.

DRRS-S is the evolution of readiness reporting to a more comprehensive system, better able to meet the Department's current and future readiness information challenges. Included in these challenges is the expansion in scope of the entities who can, and do report readiness, as well as what they report. Shifting from solely resource centric readiness reporting to a resource informed mission/capabilities based reporting system, oriented towards the National Military Strategy (NMS), makes substantially more complex demands on readiness reporting, but portrays a far more relevant and holistic picture of readiness. DRRS-S allows the Department to assess readiness globally based on the program's integrated ability to project and sustain a mix of constructed forces in simultaneous engagements. Additionally, the challenges associated with sourcing and evaluating the readiness of our forces engaged in on-going real operations mean that force managers need applications that will query the entire Department for suitable, available organizations to meet current needs. DRRS-S continues to incorporate more data, and develop more capable functionality to meet the needs of both the operational employers of the Force, but also those responsible for Force Generation.

FY2019 NDAA made revisions to Title 10 U.S. Code and provided the Department of Defense direction requiring growth in the DRRS-S program and identified the program's need to maintain the technical currency necessary to quickly meet future challenges associated with providing senior leaders with relevant and timely information. Such initiatives include implementing the complex data structures and visualization tools needed to operationalize the Global Force Management - Data Initiative, and reporting at lower organizational levels consistent with how Forces are actually employed.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** 774 Defense Readiness Reporting System | 6.606 | 9.724 | 9.793 |
| ***Description:*** The Defense Readiness Reporting System (DRRS) establishes a capabilities-based, adaptive, near real-time readiness information system for DoD. DRRS measures the readiness of military forces and supporting infrastructure to meet missions and goals assigned by the Secretary of Defense. The realization of DRRS required integrating a host of key technologies to achieve an information system that supports distributed, collaborative, and dynamic readiness reporting in addition to continuous tool-based assessment. The primary technical goal was the creation of a highly reliable and securely integrated | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0604774D8Z / *Defense Readiness Reporting System (DRRS)* | **Project (Number/Name)**<br>774 / *Defense Readiness Reporting System (DRRS)* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| readiness data environment to leverage and extend current readiness information systems. DRRS contains readiness metrics and supporting data for forces and support organizations.<br><br>***FY 2020 Plans:***<br>• Continue development within DRRS-S of the software components and functionality required to facilitate the retirement of the Services' DRRS instances<br>• Continue replacement of vulnerable & legacy software components<br>• Optimize program architecture to make use of hosting technology advancements<br>• Incorporate functionality enhancements required by evolving readiness reporting needs of the Department, to include new data sets, functionality, analytic and display tools<br>• GFM DI "next steps" functionality development<br><br>***FY 2021 Plans:***<br>• Integration into DRRS-S of data sources and the creation of new functionality necessary to support readiness reporting reform efforts.<br>• Optimize program architecture to make use of hosting technology advancements<br>• Incorporate functionality enhancements required by evolving readiness reporting needs<br>• GFM DI "next steps" development<br>• Replacement of vulnerable & legacy software components<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The minor increase in FY2021 is due to enduring requirements to keep DRRS technologically current and to meet the evolving needs of the Department for more data, improved aggregation and presentation; as well as the implementation of readiness reporting improvements identified through the Department's readiness reporting reform initiative and the Congressionally mandated report required under FY2019 NDAA Sec 358(d). | | | |
| **Accomplishments/Planned Programs Subtotals** | 6.606 | 9.724 | 9.793 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support* | **R-1 Program Element (Number/Name)**<br>PE 0604875D8Z / *Joint Systems Architecture Development* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 23.797 | 3.929 | 9.593 | 8.497 | - | 8.497 | 8.436 | 8.147 | 8.407 | 8.582 | Continuing | Continuing |
| 875: *Portfolio Systems Acquisition (PSA)* | 18.808 | 2.934 | 4.092 | 4.413 | - | 4.413 | 4.672 | 4.257 | 4.398 | 4.486 | Continuing | Continuing |
| 220: *Electronic Warfare Executive Committee* | 4.989 | 0.995 | 5.501 | 4.084 | 0.000 | 4.084 | 3.764 | 3.890 | 4.009 | 4.096 | Continuing | Continuing |

**Note**

In FY 2020, the increase of approximately $4.000 million in Joint Systems Architecture Development account is due to new and expanded mission areas and requirements in the Assistant Secretary of Defense for Acquisition (ASD(A)) portfolio as a result of the USD (A&S) re-organization. In addition, these funds will support the Electromagnetic Warfare Executive Committee (EW EXCOMM) pursue solutions to issues such as Electronic Battle Management (EMBM), and the development of a comprehensive electronic warfare strategy to identify gaps and requirements across the Department. The funds will include support to the mission engineering analyses and integration to incorporate soft kill and Electronic Warfare effects, and weapon systems in critical mission thread areas in order to meet evolving threats.

**A. Mission Description and Budget Item Justification**

Department and acquisition reform initiatives call for top down, national security strategy-driven capabilities-based planning. Department of Defense (DoD) Instruction 5000.02 and Chairman of the Joint Chiefs of Staff Instruction 3170.01 promulgate capabilities-based requirements and acquisition processes. The JSAD program enables collaborative efforts to achieve these goals with a focus on Major Defense Acquisition Programs (MDAPs). These efforts include warfighting capability-based analyses; assessments of joint capability areas and joint integrating concepts; development of system-related data; integrated roadmaps to support acquisition investment decisions; and assessments of MDAPs in a capability area context. Activities in the JSAD project are divided into three areas: (1) capability-based analysis; (2) roadmaps; and (3) support tools and guidance. Capability-based analysis provides analysis of the different technology, functionality, and integration impacts of systems on warfighting capability. Acquisition roadmaps guide systems development and associated investment plans. JSAD support tools and guidance initiatives develop systems data, and tools, exploit modeling and simulation and architecture efforts to improve DoD's overall assessment capability. These efforts guide the development and improve the testing and fielding of integrated systems of systems in order to achieve Joint mission capabilities. The Department has also undergone an institutional reorientation or shift in emphasis from organization-specific to enterprise-wide approaches, which includes: (1) horizontal integration within the Department and unity of effort through greater interagency collaboration; (2) engaging in a coordinated and portfolio-based approach to planning, programming, budgeting and execution; and (3) significant reforms at the governance, management and execution levels. To accomplish this intent, there needs to be a focused goal and concerted emphasis on shifting from systems acquisition to capabilities-based portfolio management (or portfolio systems acquisition). This program enables collaborative efforts to implement the Quadrennial Defense Review (QDR) direction outlined above in order to achieve portfolio systems acquisition goals. The program is broken up into two focus areas (Portfolio Management and Reform Initiatives).

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support* | **R-1 Program Element (Number/Name)**<br>PE 0604875D8Z / *Joint Systems Architecture Development* |

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 4.079 | 9.593 | 9.778 | - | 9.778 |
| Current President's Budget | 3.929 | 9.593 | 8.497 | - | 8.497 |
| Total Adjustments | -0.150 | 0.000 | -1.281 | - | -1.281 |
| • Congressional General Reductions | 0.000 | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | -0.149 | - | | | |
| • A&S realignment to priority efforts for Industrial Policy/Special Programs/GSA | - | - | -0.767 | - | -0.767 |
| • Cancelled Accounts | -0.001 | - | - | - | - |
| • Economic Assumption | - | - | -0.009 | - | -0.009 |
| • Defense Wide Review Adjustment | - | - | -0.505 | - | -0.505 |

**Change Summary Explanation**

In FY 2020, the increase of approximately $4.000 million in Joint Systems Architecture Development (JSAD) funds is due to new and expanded mission areas and requirements in the Assistant Secretary of Defense for Acquisition (ASD(A)) portfolio as a result of the USD Acquisition and Sustainment (A&S) re-organization. In addition, these funds will support the Electronic Warfare Executive Committee (EW EXCOMM) pursuit of solutions to issues such as Electromagnetic Battle Management (EMBM), and the development of a comprehensive electronic warfare strategy to identify gaps and requirements across the Department. The funds will include support to the mission engineering analyses and integration to incorporate soft kill and Electronic Warfare effects, and weapon systems in critical mission thread areas in order to meet evolving threats.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 6 | R-1 Program Element (Number/Name)<br>PE 0604875D8Z / *Joint Systems Architecture Development* | Project (Number/Name)<br>875 / *Portfolio Systems Acquisition (PSA)* | |

| COST ($ in Millions) | Prior Years (+) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 875: *Portfolio Systems Acquisition (PSA)* | 18.808 | 2.934 | 4.092 | 4.413 | - | 4.413 | 4.672 | 4.257 | 4.398 | 4.486 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

(+) The sum of all Prior Years is $0.004 million less than the represented total due to several projects ending

**Note**

In FY 2020, the funding increase of approximately $4.000 million in Joint Systems Architecture Development (JSAD) funds is due to new and expanded mission areas and requirements in the Assistant Secretary of Defense for Acquisition (ASD(A)) portfolio as a result of the USD Acquisition and Sustainment (A&S) re-organization. In addition, these funds will enable Electronic Warfare Executive Committee (EW EXCOMM) pursuit of solutions to issues such as Electromagnetic Battle Management (EMBM), and the development of a comprehensive electronic warfare strategy to identify gaps and requirements across the Department. The funds will include support to the mission engineering analyses and integration to incorporate soft kill and Electronic Warfare effects, and weapon systems in critical mission thread areas in order to meet evolving threats.

**A. Mission Description and Budget Item Justification**

The Department's 2005 Quadrennial Defense Review (QDR) laid out the need for an institutional reorientation or shift in emphasis from organization-specific to enterprise-wide approaches which meant: (1) horizontal integration within the Department and unity of effort through greater interagency collaboration; (2) engaging in a coordinated and portfolio-based approach to planning, programming, budgeting and execution; and (3) significant reforms at the governance, management and execution levels. The Department's 2010 QDR report further addressed reforming how we buy, noting that the conventional acquisition process is too long and too cumbersome to fit the needs of the many systems that require continuous changes and upgrades - a challenge that will become only more pressing over time. Better Buying Power (BBP) is the implementation of best practices to strengthen the Defense Department's buying power, improve industry productivity, and provide an affordable, value-added military capability to the Warfighter. Launched in 2010, BBP encompasses a set of fundamental acquisition principles to achieve greater efficiencies through affordability, cost control, elimination of unproductive processes and bureaucracy, and promotion of competition. BBP initiatives also incentivize productivity and innovation in industry and Government, and improve tradecraft in the acquisition of services. The Department will improve how it matches requirements with mature technologies, maintains disciplined systems engineering approaches. To accomplish this direction, there needed to be a focused goal and concerted emphasis on shifting from acquisition of individual systems to portfolio management (or portfolio systems acquisition). This program enables collaborative efforts to implement the QDR direction outlined above and advance BBP initiatives to achieve portfolio systems acquisition goals and to develop and implement acquisition reform initiatives.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| ***Title:*** Portfolio Systems Acquisition (PSA) | 2.934 | 4.092 | 4.413 | 0.000 | 4.413 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0604875D8Z / *Joint Systems Architecture Development* | **Project (Number/Name)**<br>875 / *Portfolio Systems Acquisition (PSA)* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| ***Description:*** The program is broken up into two focus areas (Portfolio Management and Reform Initiatives) and consolidates work previously performed under various other Program Elements.<br><br>FY 2019 Accomplishments:<br>- Continued A&S staff re-organization efforts resulting from the dissolution of OUSD(AT&L).<br>- Began applying Mission Engineering analysis on warfare areas to identify portfolio and program synergies, reduce duplication, and identify opportunities for cost savings.<br>- Conducted analyses and supported implementation of updated Better Buying Power (BBP) initiatives.<br>- Provided technical expertise in management of warfare area portfolios.<br>- Assessed progress of program management initiatives and continued support to a variety of certification and qualification standards activities.<br>- Continued "reliability by design", capability, capacity, and lethality analyses and support to programs.<br>- Updated roadmaps to guide investments in critical areas (for example:Future Vertical Lift, unmanned systems, ground vehicles, weapons/munitions and Integrated Air and Missile Defense (IAMD)).<br>- Provided analytical support for the IAMD portfolio.<br>- Performed analytical support for the munitions acquitisiom process, from requirements generation to demilitarization.<br>- Piloted Mission Engineering practice within A&S to evaluate warfighter priority mission areas with a rigorous, data-driven analytic process to determine how systems work together in an operationally relevant environment and identify ways to integrate technology and systems to provide affordable capability solutions for our warfighters.<br>- Advised senior Department leaders on strategies to produce, develop, and sustain the F-35 Lightning II program and worldwide fleet of aircraft.<br>- Developed and implemented a comprehensive acquisition strategy to identify capability gaps and requirements across the F-35 enterprise.<br>- Provided technical expertise to identify F-35 portfolio synergies to reduce program duplication, improve aircraft production, improve fleet health, and identify cost savings.<br>- Responded to Government Accountability Office (GAO) inquiries.<br>- Responded to DOD Inspector General (DODIG) inquiries.<br>- Coordinated and participated in senior level leadership meetings for the F-35 program to include Executive Steering Groups (ESGs) and Acquisition Small Groups (ASGs). | | | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0604875D8Z / *Joint Systems Architecture Development* | **Project (Number/Name)**<br>875 / *Portfolio Systems Acquisition (PSA)* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| - Provided expert acquisition/program support to enable Programming and Budget Review (PBR) activities for the F-35 Program Objective Memorandum (POM).<br>- Provided support to the Deputy's Management Action Group (DMAG).<br>- Provided technical expertise to integrate strategic communications and develop analytical products for decision by DoD officials, U.S. Congress, and the White House.<br>- Prepared strategic communications and developed analytical products for engagements with the media, interagency, industry, and international partners.<br>- Coordinated strategic forums to promote dialogue to include the F-35 CEO Roundtable and F-35 Senior Executive Review meetings.<br>- Assessed progress of program management initiatives to support the F-35 program's shift from development & initial production to full rate production and modernization.<br>- Supported Air Warfare Major Defense Acquisition Programs (Primarily VC-25B; KC-46B; F-35; and the National Airborne Operations Center (NAOC), Executive Airlift, Airborne National Command Post (ABNCP), Take Charge and Move Out (TACAMO) (NEAT) Analysis of Alternatives (AoA))<br>- Supported Acquisition Staff Specialists with drafting, reviewing, and coordination of programmatic, policy, and congressional issues and related documentation. Examples include Action/Information Memos; read-aheads; correspondence; budget documents; Reports to Congress; congressional legislation; legislative proposals; FOIA requests and congressional, GAO and DoD IG RFIs.<br>- Supported OUSD(A&S) and CAPE meetings. Examples include NEAT AoA WIPTs, Executive SAGs, and SAGs<br>- Coordinated with OSD Joint Service Provider to provide NEAT AoA Study Team computer and software support to enable effective semi-monthly working group meetings in the National Capitol Region (NCR).<br>- Supported drafting, review, tracking, and staffing of Commercial Off The Shelf (COTS) UAS exemption waivers in accordance with Deputy Secretary of Defense (DSD) UAS Cyber Vulnerabilities Memo, May 23, 2018, and associated DSD Guidance for submission of waiver requests.<br>- Supported Chair, DoD Policy Board on Federal Aviation Working Group and UAS Subgroup<br>- Reviewed Committee on Foreign Investment in the United States (CFIUS) Cases and Draft DoD Directives and Instructions<br>- Conducted Security Reviews.<br>- Completed independent assessment of October 2016 Red Sea Events - performed by Massachusetts Institute of Technology Lincoln Laboratory. | | | | | |
| ***FY 2020 Plans:*** | | | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0604875D8Z / *Joint Systems Architecture Development* | **Project (Number/Name)**<br>875 / *Portfolio Systems Acquisition (PSA)* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| - Continue to perform portfolio management of programs falling within the Air, Ground, Maritime and Electronic Warfare mission areas, to include application of mission engineering analysis of kill chains.<br>- Identify portfolio and program synergies, reduce duplication, and identify opportunities for cost savings.<br>- Conduct analyses and support implementation of updated Better Buying Power (BBP) initiatives.<br>- Provide technical expertise in support of warfare area portfolios.<br>- Assess progress of program management initiatives and continue support to a variety of certification and qualification standards activities.<br>- Continue "reliability by design", capability, capacity, and lethality analyses and support to programs.<br>- Update roadmaps and, where appropriate, generate new roadmaps to guide investments in critical areas (for example: future vertical lift, unmanned systems, ground vehicles, weapons/munitions, and Integrated Air and Missile Defense (IAMD)).<br>- Continue analytical support for the IAMD portfolio.<br>- Continue analytical support for the munitions acquisition process, from requirements generation to demilitarization.<br>- Continue A&S staff re-organization efforts resulting from the dissolution of OUSD(AT&L).<br>- Pilot and establish Mission Engineering practice within A&S to evaluate warfighter priority mission areas with a rigorous, data-driven analytic process to determine how systems work together in an operationally relevant environment and identify ways to integrate technology and systems to provide affordable capability solutions for our warfighters.<br>- Provide leadership and support to the EW EXCOMM.<br>- Provide leadership and support to the stand-up and institution of the EW Cross Functional Team.<br>- Provide leadership and support to the Close Combat Lethality Task Force (CCLTF).<br>- Provide support to Deputy Assistant Secretary of Defense (DASD) for the stand up and initiation of the Homeland Defense Cruise Missile Defense Cross Functional Team.<br>- Respond to Government Accountability Office (GAO) inquiries.<br>- Respond to DOD Inspector General (DODIG) inquiries.<br>- Review Council on Foreign Investment in the United States (CFIUS) cases.<br>- Participate in and support senior level leadership meetings for the F-35 program to include Executive Steering Groups (ESGs).<br>- Participate in Programming and Budget Review (PBR) activities such as Strategic Portfolio Reviews (SPRs), Issue Teams, and Competitive Area Studies. | | | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0604875D8Z / *Joint Systems Architecture Development* | **Project (Number/Name)**<br>875 / *Portfolio Systems Acquisition (PSA)* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| - Provide support and participate, as needed, in the Joint Capabilities Integration and Development process, to include functional warfare working groups, Functional Capabilities Boards (FCBs), Joint Capabilities Boards (JCBs) and Joint Requirements Oversight Councils (JROCs).<br>- Lead, participate in, and provide support to the Strategic Portfolio Reviews (SPRs) and assigned issue paper teams.<br>- Provide support to the Deputy's Management Action Group (DMAG).<br>- Provide support to the 3 Star Programmer's meetings. | | | | | |
| ***FY 2021 Base Plans:***<br>- Further develop portfolio management of programs falling within the Air, Ground, Maritime and Electronic Warfare mission areas, to include application of mission engineering analysis of kill chains.<br>- Identify portfolio and program synergies, reduce duplication, and identify opportunities for cost savings.<br>- Conduct analyses and support implementation of updated Better Buying Power (BBP) initiatives.<br>- Provide technical expertise in support of warfare area portfolios.<br>- Assess progress of program management initiatives and continue support to a variety of certification and qualification standards activities.<br>- Continue "reliability by design", capability, capacity, and lethality analyses and support to programs.<br>- Update roadmaps and, where appropriate, generate new roadmaps to guide investments in critical areas (e.g., future vertical lift, unmanned systems, ground vehicles, weapons/munitions, and Integrated Air and Missile Defense (IAMD)).<br>- Continue analytical support for the IAMD portfolio.<br>- Continue analytical support for the munitions process, from requirements generation to demilitarization.<br>- Further implement Mission Engineering practices within A&S to evaluate warfighter priority mission areas with a rigorous, data-driven analytic process to determine how systems work together in an operationally relevant environment and identify ways to integrate technology and systems to provide affordable capability solutions for our warfighters.<br>- Provide leadership and support to the stand-up and institution of the EW Cross Functional Team.<br>- Provide leadership and support to the Close Combat Lethality Task Force (CCLTF).<br>- Provide support to Deputy Assistant Secretary of Defense (DASD) for the stand up and initiation of the Homeland Defense Cruise Missile Defense Cross Functional Team.<br>- Respond to Government Accountability Office (GAO) inquiries.<br>- Respond to DOD Inspector General (DODIG) inquiries.<br>- Review Council on Foreign Investment in the United States (CFIUS) cases. | | | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0604875D8Z / *Joint Systems Architecture Development* | **Project (Number/Name)**<br>875 / *Portfolio Systems Acquisition (PSA)* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| - Participate in and support senior level leadership meetings for the F-35 program to include Executive Steering Groups (ESGs).<br>- Participate in Programming and Budget Review (PBR) activities such as Strategic Portfolio Reviews (SPRs), Issue Teams, Competitive Area Studies.<br>- Provide support and participate, as needed, in the Joint Capabilities Integration and Development process, to include functional warfare working groups, Functional Capabilities Boards (FCBs), Joint Capabilities Boards (JCBs) and Joint Requirements Oversight Council (JROCs).<br>- Lead, participate in, and provide support to the Strategic Portfolio Reviews (SPRs) and assigned issue paper teams.<br>- Provide support to the Deputy's Management Action Group (DMAG).<br>- Provide support to the 3 Star Programmer's meetings.<br>***FY 2021 OCO Plans:***<br>Not applicable<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>FY 2021 increase will result in greater focus on establishing program management from a portfolio management perspective and application of mission engineering analyses of programs falling within assigned portfolios. Specifically, personnel will continue to develop outcomes based evaluation metrics and experimental designs to provide evaluation of mission effects/kill chains. | | | | | |
| **Accomplishments/Planned Programs Subtotals** | 2.934 | 4.092 | 4.413 | 0.000 | 4.413 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Not Applicable

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 6 | R-1 Program Element (Number/Name)<br>PE 0604875D8Z / *Joint Systems Architecture Development* | Project (Number/Name)<br>220 / *Electronic Warfare Executive Committee* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 220: *Electronic Warfare Executive Committee* | 4.989 | 0.995 | 5.501 | 4.084 | 0.000 | 4.084 | 3.764 | 3.890 | 4.009 | 4.096 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

The Electronic Warfare (EW) Executive Committee (EXCOM) - co-chaired by the Under Secretary of Defense for Acquisition & Sustainment (USD(A&S)), and the Vice Chairman of the Joint Chiefs of Staff (VCJCS) - is tasked to provide senior oversight, coordination, budget/capability harmonization, and advice on EW matters to the Secretary of Defense, Deputy Secretary of Defense (DSD), and the Deputy's Management Action Group (DMAG). This program develops, maintains, and implements the overarching DoD EW Strategy and Implementation Plan to achieve Electromagnetic Spectrum (EMS) superiority. This program provides technical analyses, technology assessments, capability and capability gap identification, intelligence and threat evaluations to inform DoD EW requirements, acquisition programs, and investment decisions. This program also advances EW needs in modeling, simulation, test, exercises, experimentation, and training. This budget exhibit also provides support to the EW Cross Functional Team (EW CFT) which was established and instituted in FY 2019.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| ***Title:*** Electronic Warfare Executive Committee | 0.995 | 5.501 | 4.084 | 0.000 | 4.084 |
| ***Description:*** Funds will be used to conduct analytic assessments of fielded and planned U.S. EW capabilities, threat analysis, and physics-based modeling and simulation of electronic warfare capabilities to support the Deputy Secretary of Defense-directed Electronic Warfare (EW) Executive Committee (EXCOMM) and provide support to the Electronic Warfare Cross Functional Team (EW CFT).<br><br>FY 2019 Accomplishments:<br><br>***FY 2020 Plans:***<br>- Develop a comprehensive electronic warfare strategy to identify EW capability gaps and requirements across the Department.<br>- Develop a mission engineering analyses and integration to incorporate soft kill and Electronic Warfare effects, and weapon systems in critical mission thread areas in order to meet evolving threats.<br>-Develop plans and conduct Doctrine, Organization, Training, Material, Leadership and Education, Personnel, Facilities and Policy (DOTMLPF-P) initiatives to implement the Department's EW strategy.<br>- Continue to perform the necessary analytic underpinning to develop and field advanced EW capabilities, including EW manning, training, exercises, modeling and simulation. | | | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0604875D8Z / *Joint Systems Architecture Development* | **Project (Number/Name)**<br>220 / *Electronic Warfare Executive Committee* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| - Add support Electromagnetic Battle Management (EMBM) activities to include: electromagnetic spectrum consumption modeling, force composability, data sharing policy standardization, distributed kill-chains using heterogeneous (joint / partner / different industry partners) capabilities, and Joint airborne electronic attack mission optimization (simulation analysis).<br>***FY 2021 Base Plans:***<br>- Develop a comprehensive electronic warfare strategy to identify EW capability gaps and requirements across the Department.<br>- Develop a mission engineering analyses and integration to incorporate soft kill and Electronic Warfare effects and weapon systems in critical mission thread areas in order to meet evolving threats.<br>-Develop plans and conduct Doctrine, Organization, Training, Material, Leadership and Education, Personnel, Facilities and Policy (DOTMLPF-P) initiatives to implement the Department's EW strategy.<br>- Continue to perform the necessary analytic underpinning to develop and field advanced EW capabilities, including EW manning, training, exercises, modeling and simulation.<br>- Continue support to Electromagnetic Battle Management (EMBM) activities to include: electromagnetic spectrum consumption modeling, force composability, data sharing policy standardization, distributed kill-chains using heterogeneous (joint / partner / different industry partners) capabilities, and Joint airborne electronic attack mission optimization (simulation analysis).<br>***FY 2021 OCO Plans:***<br>Not Applicable<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>FY 2021 decrease is the result of the Defense Wide Review. | | | | | |
| **Accomplishments/Planned Programs Subtotals** | 0.995 | 5.501 | 4.084 | 0.000 | 4.084 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Not Applicable

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support* | **R-1 Program Element (Number/Name)**<br>PE 0604940D8Z / *Central Test and Evaluation Investment Program (CTEIP)* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 1,369.359 | 264.179 | 390.692 | 422.451 | - | 422.451 | 410.939 | 295.606 | 304.695 | 311.395 | Continuing | Continuing |
| 940: *Central Test and Evaluation Investment Program (CTEIP)* | 1,369.359 | 264.179 | 390.692 | 422.451 | - | 422.451 | 410.939 | 295.606 | 304.695 | 311.395 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

Since its inception in FY 1990, this program element (PE) funds the development of critically needed, high-priority Test and Evaluation (T&E) capabilities for joint/ multi-Service requirements. Projects under the CTEIP PE support the National Defense Strategy and align with the USD R&E priorities. CTEIP funds projects in Hypersonics, Directed Energy, Cyber Security/Electronic Warfare, Missile Defense, Nuclear Effects, Space Autonomy and Command/Control and Communications. Other Investments align with objectives in the Strategic Plan for DoD T&E Resources for high priority test needs and common range Infrastructure.

The Central Test and Evaluation Investment Program (CTEIP) uses a corporate investment approach to combine Service, Defense, and other Government agencies T&E needs, maximize opportunities for joint efforts and avoid unwarranted duplication of test capabilities. CTEIP evaluates and selects for execution those proposed projects that best provide the greatest return on investment; make efficient use of limited test resources; leverage Service investment; and promote joint solutions to fill test capability gaps. CTEIP provides enterprise solutions that benefit the Department as a whole. The CTEIP PE supports two basic tasks: investments to improve and develop the test capabilities base (Joint Improvement and Modernization (JIM) projects) and development of near-term solutions to test capability shortfalls in support of ongoing operational test programs (Resource Enhancement Projects (REP).

The JIM funds critically needed T&E investments in the major areas across the USD R&E priorities and planned investments which continue to drive innovations on our Major Ranges and Test Facility Bases to increase efficiency and reduce the cost of testing. Examples of Critical investments include infrastructure developments needed for testing hypersonic weapon systems, electronic warfare threat emulators long range airborne telemetry, mobile optical tracking, nuclear survivability and unmanned and autonomous systems. CTEIP continues to serve as the focal point for fostering common architectures throughout the test and training communities to enhance the sharing of resources and linkages between test and training ranges.

The REP funds development of near-term solutions for critical ongoing operational tests supporting decisions on major, high-priority defense acquisition programs. These unanticipated operational test (OT) capability requirements arise from several sources such as a new threat system identified during OT planning, acquisition of foreign military assets that are critical in determining weapon system operational effectiveness and emerging technologies and test requirements resulting from operational concept changes mandated by Congress or Director, Operational Test & Evaluation (DOT&E), or system-of-systems testing. Funding these activities under the CTEIP provides the opportunity to coordinate and integrate these near-term test requirements with the total DoD test and evaluation investment planning, and ensures their availability for other programs that may have similar testing requirements.

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support* | **R-1 Program Element (Number/Name)**<br>PE 0604940D8Z / *Central Test and Evaluation Investment Program (CTEIP)* |

This Budget Activity 6 PE includes special studies, analyses, project improvements, quick reaction efforts and strategic planning related to test capabilities and infrastructure. Additionally, this activity supports the development and application of proven technologies to provide major test and evaluation capabilities required to meet DoD testing requirements for component weapon systems.

Detailed below is the description of the FY2021 CTEIP budget. FY2021 includes increased investments in high-priority hypersonic ground and open air range test capability developments, for critically needed upgrades to DoD Threat Models and Simulations, investments in High Energy Laser testing, revitalization and improvements of the Nuclear Effects testing capability and efforts to test autonomous vehicles both virtually and live.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 270.013 | 260.267 | 290.404 | - | 290.404 |
| Current President's Budget | 264.179 | 390.692 | 422.451 | - | 422.451 |
| Total Adjustments | -5.834 | 130.425 | 132.047 | - | 132.047 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | 130.425 | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | -5.788 | - | | | |
| • Other DoD Priorities | - | - | -4.277 | - | -4.277 |
| • Other Adjustments | -0.046 | - | - | - | - |
| • Economic Assumptions | - | - | -0.276 | - | -0.276 |
| • DoD add for Electronic Warfare testing | - | - | 136.600 | - | 136.600 |

**Change Summary Explanation**

FY 2020: Congressional adjustments include $20.000 million for Hypersonics Test Facilities, $45.625 million for Hypersonics Ground Testing, $7.000 million for Space Test Infrastructure, $12.500 million for Flight Test Infrastructure, $20.000 million for Directed Energy Infrastructure, $10.000 million for Cyber Infrastructure, $3.000 million for Cyber Resiliency, and $12.300 million for Defense Threat Center Excellence.
FY 2021: Adjustments include an increase of $136.600 million for Electronic Warfare testing and a reduction of $4.277 million for other DoD priorities.

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Central Test and Evaluation Investment Program | 264.179 | 390.692 | 422.451 |
| ***Description:*** Joint Investment and Modernization Projects: | | | |

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| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| - Continued development of the initial unit and integration with NEWEG project test capability of the Advanced Dynamic Transmitter Array (ADTRA) project to provide a complex, dynamic radio frequency (RF) threat environment at the Benefield Anechoic Facility (BAF) to test advanced aircraft against EW threats.<br>- Completed the preliminary and final design of the FLY-out System for the Advanced Range Tracking and Imaging System (ARTIS) project to provide an integrated next generation suite of optical tracking systems to increase performance, reduce costs and establish secure reliable optical tracking capability on DoD open-air ranges.<br>- Completed System Requirements Reviews for both systems of the Advanced Vehicle Durability Testing (AVDT) project that develops a multi-axle vehicle chassis simulator and a drive train simulator at Aberdeen Proving Grounds, MD in order to test 4 and 5 axle vehicle performance and reliability.<br>- Completed critical design review and risk reduction for the Advanced Weapons Effects Test Capability (AWETC) project to develop a capability to more accurately measure fragment characteristics of explosive weapons (2mm size and above) and more accurately estimate collateral damage distances.<br>- Completed Requirements and Project Planning for all subprojects and Preliminary Design for the Guardian subproject for the Autonomy, Integration and Teaming (AIT) project to develop the capability to safely operate Unmanned and Autonomous aerial vehicles in controlled airspace.<br>- Completed requirements development and project planning for the Autonomous Systems Test Capability (ASTC) project that develops test capability for DoD autonomous ground systems.<br>- Completed development and Factory Acceptance Testing for CLPS unit #1 of the Closed Loop PESA Simulator (CLPS) project to develop a closed-loop radar system that will closely replicate the performance of a widely fielded Western Pacific (WESTPAC) long-range surface-to-air missile (SAM) system.<br>- Finalized procurement and delivery of the G550 AEW aircraft and completed PDR #1 for the Commercial Derivative Aircraft Based Instrumentation Telemetry System (CBITS) project provides expanded telemetry support for aircraft and missile defense testing in inter-range and broad ocean area weapons testing. Evaluations of the PDR design indicated the design would not satisfy the complete system specifications required to support the Concept of Operation Use Cases.<br>- Completed work on upgrades focusing on correlation with Western Test Range open air systems for the Common Modeling and Simulation (M&S) Threat Environment Model for Long Range Strike (LRS) Family of Systems project which improves constructive mission-level models (Suppressor and ESAMS) to evaluate LRS Family of Systems survivability performance against a modern threat Integrated Air Defense System.<br>- Continued site activation at 6 ranges for the completed F-22 configuration deliveries. Initiated software upgrade to Windows 10. Continued the Interim Contractor Support contract to provide initial support for the Common Range Integrated Instrumentation System (CRIIS) project that establishes a high dynamic, sub-meter, military standard (MILS) capable range instrumentation system. | | | |

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| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| - Completed fielding at SPAWAR Systems Center Pacific, CA and supported USS Secure Serial 7 and 8 test events for the Cyber Test Analysis and Simulation Environment (Cyber TASE) project that provides the ability to test enterprise level IT systems against increasingly robust Cyber threats.<br>- Provided support to Test and Evaluation/Science and Technology (T&E/S&T) Program efforts for the Dense Plasma Focus (DPF) project that that provides very short pulse neutron effects test capability for certification and survivability testing of new circuit card designs.<br>- Completed risk reduction under the Enhanced Solutions Process (ESP) for the Direct Inject Electro-Optical-Infrared System (EO-IR). This proposal provides a test capability for high speed, coordinated EO/IR sensor stimulation to ensure comprehensive testing of sensor fusion algorithms for aircraft and helicopters.<br>- Contract awarded and System Requirements Review completed on the Direct Inject Jammer Common Operating Picture (DIJCOP) project that provides real-time awareness, data collection and analysis of DIJ health, status and geolocation information for both White and Red Cell operations at JRTC, Ft Polk, LA and JMRC, Hohenfels, Germany.<br>- Completed requirements development, risk reduction and preliminary design for key HEU elements. Completed test casting of a depleted uranium safety block to confirm production process prior to casting with HEU on the Fast Burst Reactor Upgrade (FBRU) project that replaces the Highly Enriched Uranium HHEU) fuel for the existing FBR with new fuel (seven rings and two safety blocks) to test missile components to required levels of short-pulse neutrons simulating Nuclear Weapons Effects.<br>- Completed initial prototype development finalizing design for the Global Position System Localized EW Emitter (GPS LEWE) project to provide low energy, vehicle mounted GPS jamming capability for testing of ground vehicle communications and navigation systems against GPS jamming.<br>- Continued design activities on the G-Range Weather Effects project that upgrades the three inch G-range test track at AEDC to provide a small scale dust, rain, and snow erosion hypersonic test capability.<br>-Continued the development of requirements and started design activities for the High Altitude LIDAR Atmospheric Sensing (HALAS) system that provides DOD launch and flight test ranges with improved ability to measure atmospheric conditions to reduce uncertainty and improve launch and recovery operations.<br>- Continued design work on the Holloman AFB High Speed Test Track (HHSTT) to provide a full scale rain erosion capability to validate vehicle structural designs and qualify hypersonic weapon systems for flight in an open air environment.<br>- Continued design activities for the heater pit construction and initiated refractory brick procurement. Source selection for the system integration contract completed and work started to complete component designs and start ordering long lead items for the Hypersonic Test Capability Improvement Project (Phoenix) to provide a clean air, variable Mach ground test capability for hypersonic system prototypes from Mach 4 to Mach 7.5 at Arnold Engineering Development (AEDC) Complex, TN.<br>- Completed integration of five threat command posts at the Electronic Combat Range, China Lake, CA. for the Integrated Air Defense System (IADS) Enhancements project that fields high-priority, threat-representative Command Post (CP) models to open air test ranges. | | | |

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| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| - Continued early operational capability fielding at NAS Patuxent River, MD and Edwards AFB, CA for the Integrated Network Enhanced Telemetry (iNET) Project Block I capability to develop a network-enhanced aeronautical telemetry capability for T&E ranges and facilities.<br>- Completed analysis and designs required for supported EW projects on the Integrated Technical Evaluation and Analysis of Multiple Sources (ITEAMS) activities to provide detailed analysis and validation of threat system designs and operational techniques for integration into ongoing electronic warfare projects.<br>- Completed EW investment roadmap on the Joint Electronic Warfare T&E Study (JETS) developed a high level follow-on investment strategy to the 2010 Tri-Service EW Test Capability Study (TEWTCS) to maintain and advance air superiority as a critical component of EW Air Dominance and the National Defense Strategy.<br>- Installed Knowledge Management capabilities at Edward AFB, CA. for the Joint Strike Fighter Knowledge Management, Big Data Analytics project establishes next-generation big data analytics and knowledge management capabilities utilizing the latest in virtualization technologies, methodologies, and best practices for efficient and effective use of T&E data.<br>- Completed requirements development and project planning. Initiated development and testing of target boards for small UAVs and subsonic cruise missiles to support Service prototype testing on the Mobile High Energy Laser Measurement (MHELM) project to support testing of directed energy weapon systems.<br>- Completed CDS network environment and multi-level desktop for the Multi-Level Secure Joint/Coalition Network Environment (MLS-JCNE) project providing a DoD multi-level secure and cross-domain data management T&E network environment at the TRMC JMETC SYSCON, NAS Patuxent River and multilevel workstation for cross-domain data management at the Manned Flight Simulation Facility, NAS Patuxent River. .<br>- Completed requirements development and project planning on the Mission System Test Capability (MSTC) project that develops the capability to support integration and interoperability testing of Multi-Function Advanced Data Link (MADL) in a ground test, simulation environment.<br>- Completed development, initial assembly and test on the Mid-Pressure Arc Heater (MPAH) project that expands the H2 Hypersonic Test Facility at Arnold Engineering Development (AEDC) Complex, TN to provide higher enthalpy at the mid-pressure altitudes to enable ground materials testing of components of hypersonic systems.<br>- Continued development on the M&S for Weather Effects on Hypersonic Systems project that provides a database of realistic and relevant weather conditions as a basis for ground test requirements, and develops advanced material response models validated with improved ground test data to predict weather erosion in flight.<br>- Provided NCWTEE servers to China Lake, CA for the Network Centric Weapon T&E Environment (NCWTEE) project that establishes the capability to test and evaluate network centric weapons in a distributed end-to-end simulation environment. Completed Increment 2 Datalink development and continued development of digital scene generation capability. Supported Joint Tactical Attack Controller developmental testing from the NCWTEE Lab. | | | |

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| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| - Completed Full Operational Capability at NAS Patuxent River, MD. Continued procurement and integration for NEWEG systems at the Electronics Combat simulation and Evaluation Laboratory (ECSEL), Pt Mugu, CA and the Benefield Anechoic Facility (BAF), Edwards AFB, CA.<br>for the Next Generation Electronic Warfare Environment Generator (NEWEG) Build B project that provides advanced electronic warfare simulation/stimulation capabilities for testing future Electronic Attack and Electronic Support Measures systems at multiple DoD test facilities and reprogramming laboratories.<br>- Continued work on projects for the Non-Internet Protocol Cyber Test Tools. A portfolio of projects to provide cyber test tools required to evaluate cyber security of weapon systems components, data links, communications buses and other critical items.<br>- Worked requirements for the Open-Air Multi-Spectral Data Collection (OAMSDC) which provides enhanced IR missile signature open air data collections processes; provides conduits for playback of observed IR missile shots to an open air missile plume simulator; provide multi-mode (RF + IR) threat missile presentations to systems under test; and a Joint Multispectral Target Board (JMTB).<br>- Began requirements development for the Ordnance Evaluation Range, Detonation Chamber which provides the ability of measuring hypersonic components to survive varying temperatures, vibrations, and acoustic stresses.<br>- Completed risk reduction under the Enhanced Solutions Process (ESP) Over Water Scoring System that provides persistent, relocatable range capability for open-ocean, high precision weapon scoring and range surveillance based on a “Waveglider” platform and processing software prototyped by the 96th Test Support Squadron, Eglin AFB.<br>- Completed the Ka-Band radar upgrade and hardware PDR for the Advanced Dynamic Aircraft Measurement System (ADAMS-3) system at the Atlantic Test Range for the Radar Cross Section Range Relevance (RCSRR) project comprised of 11 subprojects that upgrade radar cross section (RCS) capabilities at both the National Radar Cross Section (RCS) Test Facility (NRTF), Holloman AFB, NM, and the Atlantic Test Range (ATR), NAS Patuxent River, MD to improve infrastructure to ensure test measurement capabilities and throughput capacities at both ranges are sufficient to measure and evaluate advanced low observable technologies. At the NRTF completed the new Command and Control system, calibration pit, new data signal processing software, new HF antenna, refurbished target support pylon. Initiated the new fiber optic network perimeter security subprojects at the NRTF.<br>- Completed integration of 16 RSE and 5 classified threat devices at the Nevada Test and Training Range (NTTR), NV and Navy Land and Sea Ranges at China Lake and NAS Pt Magu, Supported F-35 IOT&E at NTTR, NV for the Radar Signal Emulators (RSE) project that provides open-loop, transmit-only simulators representative of threat radar systems operating in the C and S radio frequency (RF) bands.<br>- Completed preliminary design of the air-to-air and advanced signal blocks. Radar Air-to-Ground Environment (RAGE) project provides an installed test facility, ground test capability for testing advanced aircraft radars in high-density air-to-air environments. The air-to-ground block is awaiting technology maturation as an entrance criterion. | | | |

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| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| - Initiated funding for the RF and IR threat model development process in cooperation with the Test and Evaluation Threat Resource Activity (TETRA), for the Radio Frequency and Infrared Modeling and Simulation project develops at least 20 classified Intelligence Production Center-certified threat system models for use in DoD test and evaluation simulators.<br>- Completed three efforts: Range Reference Atmosphere Update, Thresholds and Rationale in Defense of UAS Risk Criteria and IEEE-1588 Precision Time Protocol update for the Range Commander's Council Technical Group projects. The RCC Technical Groups manage inter-range policies and procedures.<br>- Initiated the Reconfigurable RF Target Simulator (RRFTS) project to upgrade an Eglin AFB facility to test prototype sensors in a simulated hypersonic target and scene environment.<br>- Supported the development of the White House "Developing a Sustainable Spectrum Strategy for America's Future" memorandum, reviewed proposed legislation (e.g. H.R. 471, Wireless Investment Now in 5G Act and S.2223, Advancing Innovation and Reinvigorating Widespread Access to Viable Electromagnetic Spectrum (AIRWAVES) Act), Evaluated 10 papers for the International Consortium for Telemetry Spectrum for the Spectrum Stewardship project that ensures DoD T&E spectrum concerns are addressed in domestic and international forums establishing policies related to issues such as spectrum management, frequency allocations, and spectrum interference that impact DoD test and evaluation ranges.<br>- Completed Phase I and Phase II analysis of hypersonic platform flight safety parameters, flight path geographical safety data and individual DoD and Allied range data for the Study of Open Air Ranges for Hypersonic Test (SOAR-H) to determine an optimum range of solutions for the Open Air Range flight testing of hypersonic systems.<br>- Demonstrated semi-autonomous control of HSMST, one operator controlling 8 HSMST, and ability of HSMST to dynamically change SWARM maneuver formations. Supported operational testing against representative surface swarming threats at the Pacific Missile Range Hawaii. Completed prototype demonstrations UAS weapons impact scoring subproject capabilities and Eglin AFB, FL for the SWARM project that upgrades the Navy's existing High-Speed Maneuverable Surface Target (HSMST) with semi-autonomous control and develops an overhead scoring capabilities for testing US Navy ship defense systems and US aircraft weapons against representative surface swarming threats.<br>- Completed requirements development, project planning and initiated development for the Technology Development Acquisition Program Next Generation (TDAP NGEN) project that implements a new set of IT tools to support the T&E Board of Directors Reliance Process in order to receive, review and prioritize Service test and evaluation gaps and development proposals.<br>- Completed a study of current adversarial, non-adversarial, and commercial capabilities utilizing Quantum Technologies. Initiated development of a proof of concept prototype system for Quantum Encryption Key Distribution (QKD) for the Threat Management Office Integrated Threat Force, Redstone Arsenal, MD. for the Threat Center of Excellence project that provides research, evaluate new technologies and methodologies to counter critical conventional threats posed by traditional and non-traditional adversaries focused initially on the Cyber, EW, and small UAS threats.<br>- Continued development of the Transient Thermal Analysis Software (TTAS) project that provides improved capabilities for predicting aerothermal and ablation response to high speed, high temperature flow in flight test environments. | | | |

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| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| - Continued development of the program for the Tunnel 9 High Mach Number project that develops a Mach 18 test capability at the AEDC White Oak, MD facility to support aero/aero-thermodynamic modeling and simulation supporting intermediate range and strategic boost glide vehicle and maneuvering system concepts.<br>- Continued the UAV Range (UAV Range) project development in coordination with associated T&E/S&T Program efforts for the Unmanned Aerial Vehicle (UAV) Range project to provide Global Hawk UAVs equipped with telemetry, Light Detection and Ranging System (LIDAR) and optical tracking for inflight data collection of hypersonic systems.<br>- Worked program requirements for the X-Ray Simulators for Test and Evaluation of Nuclear Survivability (XSTENS) project to replace or upgrade three X-ray simulators that measure the susceptibility of missile components to damage from high dose warm and cold x-rays experienced in space.<br><br>Resource Enhancement Projects:<br>- Awarded contract and completed a System Requirements Review (SRR), and Preliminary Design Review (PDR) for the Advanced Communication Threat Testing Suites (ACTTS) Uplink project develops EW threat representative uplink jamming system to support test and evaluation of end-to-end satellite system responsiveness to threat systems operating in applicable bands. ACTTS-U will be the only upper band operationally relevant Super High Frequency (SHF) electronic attack capability available with Extremely High Frequency (EHF) low Probability of Intercept/Low Probability of Detection (LPI/LPD).<br>- Completed system integration Risk Reduction III (RR3) testing on the Airborne Early Warning Interoperability Simulator (AEIS) project develops the hardware and software necessary to generate a properly spaced, dense target and Electronic Counter Measure (ECM) environment for injection-mode Installed Systems Test Facility (ISTF) testing.<br>- Completed System Requirements Reviews (SRR) for the Air Warfare Battle Shaping (AWBS) develops a capability connecting ranges/assets and creates a Threat Integrated Air Defense System (IADS) coupled with the Live/Virtual/Constructive (LVS) Laboratory Electronic Attack (EA) effect.<br>- Continued development, received all parts and assembled prototype on the Common Operational Test Vehicle and Engagement Real-Time Test Instrumentation (COVERT-I) will improve the data collection footprint in Abrams tanks and Bradley fighting vehicles by reducing from three unique data collectors to one modular, scalable data collector with increased storage capacity.<br>- Completed Phase I feasibility study for the Dynamic DIADS Control of CEESIM (D2C2) develops a capability to have DIADS drive CEESIM radar engagements in real time vs static, script-based engagements. Adds Pilot-in-the-Loop dynamics to EW testing.<br>- Completed Phase I, developed and accomplished in-water testing of the High Speed Quiet Propulsion System (HSQPS) for the General Threat Torpedo (GTT) that develops a threat torpedo surrogate with upgradable interchangeable segments, as an upgrade replacement for the current threat surrogate torpedo.<br>-Completed development, finalized integration, tested system, and delivered to Electronic Combat Range (ECR) to support the EA-18G Growler Operational Test (OT) events for the Integrated Digital Acquisition Radar Environment - Upgrade (IDARE- | | | |

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| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| U) capability that upgraded two NAWCWD Electronic Combat Range OEM Radars' analog output with digital upgrade for downstream digital messaging.<br>- Continued development of the track mount and subassemblies and completed the Software Design Review of the background suppression software capability of the Joint Standard Instrumentation Suite (JSIS) Phase 2 capability that measures and collects missile attitude (6DOF) as well as signature, TSPI, and related data for a larger portion of the threat MANPADS trajectory at the required accuracies within a single firing to support evaluation of the missile/hostile fire warning systems such as the Advance Threat Warning (ATW).<br>- Initiated and completed the System Requirement Review (SRR), Project Management Plan (PMP) and a prototype of the Post Intercept Debris Simulation (PIDS) capability will enhance Navy Probability of Raid Annihilation simulator federation with realistic post-missile intercept debris.<br>- Completed the emitter and radome performance specifications and awarded the contract for Phase 2 for the Pulsed Doppler Emitter Capability Payload for Aerial Targets (PDEC-163) develops kinematic threat representations and threat representative emissions to provide the DDG-1000 OT SUT with the ability to collect data necessary for COTF to accredit the DDG-1000's fire control loop weapons system response to threat targets.<br>- Initiated project and has awarded the Army Missile Plume Simulator (MPS) contract, completed a Critical Design Review (CDR), and assembled the first modulator cell of the Multi-Spectral Sea and Land Target Simulator (MSALTS) Emitter Upgrade that improves MSALTS and Joint Mobile Infrared Countermeasure Test System (JMITS) emitter bandwidth in order to keep up with emerging System Under Test (SUT).<br>- Completed the build, delivery, and launch of the 10x10x10cm free flying CubeSat with 2 and 4cm targets for the Space Fence Radar operational testing for the Space Fence Evaluation of Radar Effectiveness (SFERES) which developed a 3-axis stabilized CubeSat that released two spheres into orbit in order to support accurate evaluation of the Space Fence radar.<br>- Completed Phase 1 of the ULB engineering design effort for a production ULB Emitter Generation Rack for the Ultra Low-band Time Difference Of Arrival (UT) which develops a capability for a time difference of arrival (TDOA) multi-aircraft test configuration to support three aircraft under test in both the Air Combat Environment Test and the Evaluation Facility (ACETEF) and Electronic Combat Simulation and Evaluation Lab (ECSEL).<br>- Began requirements development for the Battlefield Awareness Testbed (BAT) which intends to develop a mobile communications laboratory intended to replicate the voice, data, and video environments of tomorrow's battlefield, while also providing reach-back to legacy systems.<br>- Developed requirements for a Program Management Plan for the Maritime Survivability Library (MSL) which plans to develop a weaponeering tool for timely planning and execution of surface warfare strike missions. The T&E community requires a tool to accurately evaluate the lethality of emerging anti-ship weapons for use in acquisition decisions.<br>- Developed requirements for a Program Management Plan for the Non-IP Cybersecurity Suite (NICS) that proposes to develop a hardware and software framework to automatically connect to non-IP interfaces, decode non-IP communications protocols, | | | |

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|---|---|---|---|
| and launch basic non-IP cyberattacks through a Graphical User Interface and a software Application Programming Interface to dramatically accelerates and expands non-IP cybersecurity testing.<br>- Developed requirements for a Program Management Plan for the Tactical Aerospace Laser Optical Simulator – High Altitude (TALOS HIGH) which intends to develop a dual laser threat simulation capability within a 2-story cryo-vacuum chamber to evaluate space-based ISR sensors against surrogate ground- and air-based laser threats within a simulated space environment.<br>- Developed requirements for a Program Management Plan for the Towed Array Threat Emulator (TATE) that proposes to develop a modular towed array to support T&E needs. The array will be designed to support receive and transmit nodes defined for the System Under Test (SUT). Each transmit and receive node will deliver raw data to the array tow vehicle for processing and generation of an acoustic or tactical response.<br><br>***FY 2020 Plans:***<br>JIM Projects:<br>- Complete Factory Acceptance and Site Acceptance testing for unit 1, award the procurement contract for Units 2 through 7 for the Advanced Dynamic Transmitter Array (ADTRA) project that provides a complex, dynamic radio frequency (RF) threat environment at the Benefield Anechoic Facility (BAF).<br>- Continue development of the Advanced Range Tracking and Imaging System (ARTIS) project to provide the next generation of optical tracking mounts on DoD open-air ranges. Continue Fly-out System development, start Close-in System development, and start Variable Metric Zoom Lens development.<br>- Complete Preliminary and Critical Design Reviews and begin construction of required facilities and facility improvements for the Advanced Durability Testing (AVDT) that develops a multi-axle vehicle chassis simulator and a drive train simulator at Aberdeen, MD.<br>- Complete IOC and FOC at three ranges for the Advanced Weapons Effects Test Capability (AWETC project to develop a capability to more accurately measure fragment characteristics of explosive weapons (2mm size and above) and more accurately estimate collateral damage distances.<br>- Complete critical design for the Guardian subproject, complete preliminary design for the UAS Test Tools and Army subprojects, continue preliminary design of 2 other subprojects for the Autonomy, Integration and Teaming (AIT) project that develops the capability to operate Unmanned and Autonomous aerial vehicles safely in controlled airspace.<br>- Start system design and development of Software Release 1 for the Autonomous Systems Test Capability (ASTC) Ground project that develops test capability for Service autonomous systems. Start development of the Safety Environment, Engagement and Response (SEER) sub-project to allow safety testing of full scale autonomous vehicles at Aberdeen Test Center, MD.<br>- Complete fielding of the first unit of the Closed Loop PESA Simulator (CLPS) project to NTTR, NV to provide a closed-loop radar system that replicates the performance of a widely fielded Western Pacific (WESTPAC) long-range surface-to-air missile (SAM) system. Continue manufacturing and integration of the second CLPS system. | | | |

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| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| - Prime Contractor and the government are exploring technical options and will determine path forward for the Commercial Derivative Aircraft Based Instrumentation Telemetry System (CBITS) project that provides expanded telemetry support for aircraft and missile defense testing in inter-range and broad ocean area weapons testing.<br>- Completes initial capability to deliver enhanced survivability evaluation in IC-projected peer and near-peer Integrated Air Defense systems for the Common Modeling and Simulation (M&S) Threat Environment Model for Long Range Strike (LRS) Family of systems.<br>- Complete Lot 3 deliveries and the Windows 10 upgrade for the Common Range Integrated Instrumentation System (CRIIS) project that establishes high dynamic, sub-meter, MILS capable range instrumentation system. Award the Contractor Logistics Support contract CLIN for initial sustainment.<br>- Provide support to Test & Evaluation/Science and Technology (T&E/S&T) Program efforts for the Dense Plasma Focus (DPRF) project that provides short pulse neutron effects test capability for certification and survivability testing of new circuit card designs.<br>- Complete requirements development for the Direct Inject Electro-Optical-Infrared System (EO-IO) which provides test capability for high speed, coordinated EO/IR sensor stimulation.<br>- Conduct preliminary and critical design on the Direct Inject Jammer Common Operating Picture (DIJCOP) project that provides real-time awareness, data collection and analysis of DIJ health, status and geolocation information for both White and Red Cell operations at JRTC, Ft Polk, LA and JMRC, Hohenfels, Germany.<br>- Complete High Enriched Uranium (HEU) casting and aluminum coating of the safety blocks. Deliver safety blocks to White Sands Missile Range and start development work on casting the first set of HEU rings for the Fst Burst Reactor Upgrade (FBRU) project that replaces the Highly Enriched Uranium HHEU) fuel for the existing FBR with new fuel (seven rings and two safety blocks) to test missile components to required levels of short-pulse neutrons simulating Nuclear Weapons Effects.<br>- Field two low energy GPS jammer production units with Army procuring remaining units for use at Army Test and Training Centers. Complete design for high power, trailer mounted variant for the Global Position System Localized EW Emitter (GPS LEWE) project to provide low energy, vehicle mounted GPS jamming capability for testing of ground vehicle communications and navigation systems against GPS jamming.<br>- Complete fabrication and test, and achieve Initial Operational Capability of the rain components for the G-Range Weather Effects project that upgrades the three inch G-range test track at AEDC to provide a small scale dust, rain, and snow erosion hypersonic test capability.<br>- Complete the design of a Ground based High Altitude LIDAR Atmospheric Sensing (HALAS) system that provides DOD launch and flight test ranges with improved ability to measure atmospheric conditions to reduce evaluation uncertainty and improve launch and recovery operations.<br>- Complete the design, fabrication, and achieve Initial Operational Capability of the Holloman AFB High Speed Test Track upgrade to provide full scale rain erosion capability to validate vehicle structural designs and qualify hypersonic weapon systems for flight in an open air environment. | | | |

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| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support* | **R-1 Program Element (Number/Name)**<br>PE 0604940D8Z / *Central Test and Evaluation Investment Program (CTEIP)* |

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| - Continue development fabrication and assembly. Heater pit construction and refractory brick procurement will be completed, and heater assembly and bottle procurement started on the Hypersonic Test Capability Improvement Project (Phoenix) to provide a clean air, variable Mach ground test capability for hypersonic system prototypes from Mach 4 to Mach 7.5 at Arnold Engineering Development (AEDC) Complex, TN.<br>- Complete fielding for IADS Enhancements project at the Electronic Combat Range, China Lake, CA for the Integrated Air Defense System (IADS) Enhancements project that fields high-priority, threat-representative Command Post (CP) models to open air test ranges.<br>- Complete fielding for IADS Enhancements project at the Electronic Combat Range, China Lake, CA. for the Integrated Network Enhanced Telemetry (iNET) Project Block I capability to develop a network-enhanced aeronautical telemetry capability for T&E ranges and facilities.<br>- Initiate project to provide expanded telemetry and connectivity between DoD western sea and land ranges for airborne test or training for the Joint Electronic Warfare T&E Study (JETS) developed a high level follow-on investment strategy to the 2010 Tri-Service EW Test Capability Study (TEWTCS) to maintain and advance air superiority as a critical component of EW Air Dominance and the National Defense Strategy.<br>- Integration of Edwards KM capability and Nellis JSF data center, and enhanced JMETC-enabled Data Management Network for the Joint Strike Fighter Knowledge Management, Big Data Analytics project establishes next-generation big data analytics and knowledge management capabilities utilizing the latest in virtualization technologies, methodologies, and best practices for efficient and effective use of T&E data.<br>- Continue development of Mobile High Energy Laser Measurement (MHELM) projects for target boards on small UAVs and subsonic cruise missile targets. Start development of sub-projects to measure reflected irradiance, measure HEL performance under range conditions, develop software tools, and measure laser irradiance on a surrogate supersonic target.<br>- Complete renovation of TRMC JMETC SYSCON and Authority to Operate the multi-level desktop at the MFS Facility, NAS Patuxent River, MD for the Multi-Level Secure Joint/Coalition Network Environment (MLS-JCNE) project providing a DoD multi-level secure and cross-domain data management T&E network environment at the TRMC JMETC SYSCON, NAS Patuxent River and multilevel workstation for cross-domain data management at the Manned Flight Simulation Facility, NAS Patuxent River.<br>- Initiate design and concept development for the Mission System Test Capability (MSTC) project that develops the capability to support integration and interoperability testing for advanced 5th generation aircraft data links (MADL) in a ground test, simulation environment.<br>- Complete assembly and testing of the Mid-Pressure Arc Heater (MPAH) system to expand the H2 Hypersonic Test Facility at Arnold Engineering Development Complex, TN to provide higher enthalpy at the mid-pressure altitudes to enable ground materials testing of components of hypersonic systems. Start development of Increment 2 providing an additional power supply for longer run times and larger test articles to support thermal protection system testing of hypersonic boost glide vehicles and other systems. | | | |

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| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| - Continue development under the M&S for Weather Effects on Hypersonic Systems project that provides a database of realistic and relevant weather conditions as a basis for ground test requirements, and develops advanced material response models validated with improved ground test data to predict weather erosion in flight.<br>- Complete FOC at ECSEL and finalize procurement of NEWEG systems for the BAF for the Next Generation Electronic Warfare Environment Generator (NEWEG) Build B project that provides advanced electronic warfare simulation/stimulation capabilities for testing future Electronic Attack and Electronic Support Measures systems at multiple DoD test facilities and reprogramming laboratories.<br>- Start the development of the Open-Air Multi-Spectral Data Collection (OAMSDC) which will provide enhanced IR missile signature open air data collections processes; provide conduits for playback of observed IR missile shots to an open air missile plume simulator; provide multi-mode (RF + IR) threat missile presentations to systems under test; and a Joint Multispectral Target Board (JMTB).<br>- Complete requirements development, project planning and initiate development of the Overwater Surveillance and Scoring (OWSS) project to provide unmanned, autonomous scoring of operationally relevant weapons tests and flexible range surveillance in remote water areas.<br>- Complete software preliminary design and critical design for the Atlantic Test Range next generation Advanced Dynamic Aircraft Measurement System (ADAMS-3). Complete the Perimeter Security and Target Preparation Facility subprojects for the National Radar Test Facility. The Radar Cross Section Range Relevance (RCSRR) project upgrades radar cross section measurement capabilities of advanced low observable technologies at the Atlantic Test Range, Patuxent River NAS, MD and the National RCS Test Facility, Holloman AFB, NM.<br>- Select prime contractors for the air-to-air and advanced signal capability blocks and conduct a Critical Design Review for the Radar Air-to-Ground Environment (RAGE) project. The air-to-ground block will initiate requirements development and project planning. The development project will provide an installed test facility, ground test capability for testing advanced aircraft radars in high-density environments.<br>- Continue preliminary design for priority Radio Frequency and Infrared Modeling and Simulation development projects.<br>- Will complete 2 efforts: the Compression & Metric Zoom TSPI Study and a Telemetry Networks Handbook and User's Guide for Range Commander's Council Technical Group projects. The RCC Technical Groups manage inter-range policies and procedures.<br>- Continue development of the Reconfigurable RF Target Simulator (RRFTS) project to upgrade an Eglin AFB facility to test prototype sensors in a simulated hypersonic target and scene environment.<br>- Continued participation in the Spectrum Incentives Working Group, International Consortium for Telemetry Spectrum, DoD and other spectrum groups for the Spectrum Stewardship project that ensures DoD T&E spectrum concerns are addressed in domestic and international forums establishing policies related to issues such as spectrum management, frequency allocations, and spectrum interference that impact DoD test and evaluation ranges.<br>- Complete Phase III analysis of flight test options for specific classified platforms for the Study of Open Air Ranges for Hypersonic Test (SOAR-H) to determine an optimum range of solutions for the Open Air Range flight testing of hypersonic systems. | | | |

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| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
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| - Complete Full Operational Capability (FOC) for both HSMST semi-autonomous and UAS based Weapon Impact Scoring for the SWARM project that upgrades the Navy's existing High-Speed Maneuverable Surface Target (HSMST) with semi-autonomous control and develops an overhead scoring capabilities for testing US Navy ship defense systems and US aircraft weapons against representative surface swarming threats.<br>- Field the initial system for Service trials of the Technology Development Acquisition Program Next Generation (TDAP NGEN) project that implements a new set of IT tools to support the T&E Board of Directors Reliance Process in order to receive, review and prioritize Service test and evaluation gaps and development proposals.<br>- Complete proof of concept QKD prototype for the Threat Center of Excellence project that provides research, evaluate new technologies and methodologies to counter critical conventional threats posed by traditional and non-traditional adversaries focused initially on the Cyber, EW, and small UAS threats.<br>- Continue development of the Transient Thermal Analysis Software (TTAS) project that provides improved capabilities for predicting aerothermal and ablation response to high speed, high temperature flow in ground and flight test environments.<br>- Complete installation and test, and achieve Initial Operational Capability of the Tunnel 9 High Mach Number project that develops a Mach 18 test capability at the AEDC White Oak, MD facility to support aero/aero thermodynamic modeling and simulation to support intermediate range and strategic boost glide vehicle and maneuvering system concepts.<br>- Continue the UAV Range (UAV Range) project to provide Global Hawk UAVs equipped with Telemetry, LIDAR and Optical tracking for inflight data collection of hypersonic systems.<br>- Start development of the X-Ray Simulators for Test and Evaluation of Nuclear Survivability (XSTENS) project to replace or upgrade three X-ray simulators that measure the susceptibility of missile components to damage from high dose warm and cold x-rays experienced in space.<br>- Receive nominations and initiate risk reduction under the Enhanced Solutions Process (ESP) for multi-Service T&E CTEIP development proposals recommended by Service Test & Evaluation Executives.<br><br>Resource Enhancement Projects:<br>- Will conduct a Critical Design Review (CDR) for the Advanced Communication Threat Testing Suites (ACTTS) Uplink Capability to develop an electronic warfare (EW) threat representative uplink jamming system to support test and evaluation of end to end satellite system responsiveness to threat systems operating in applicable bands.<br>- Will deliver HW & SW in racks to Naval Air Station Patuxent River, MD for the Advanced Hawkeye Program (E2-D APY) operational test of the Airborne Early Warning Interoperability Simulator (AEIS).<br>- Continue the development of additional enhancements to Air Warfare Battle Shaping (AWBS) investments to improve air-to-air range infrastructure for NAWC-WD.<br>- Complete development of Common Operational Test Vehicle and Engagement Real-Time Test Instrumentation (COVERT-I) to reduce the data collection footprint in Abrams tanks and Bradley fighting vehicles by reducing from three unique data collectors to one modular, scalable data collector with increased storage capacity. | | | |

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|---|---|---|---|
| - Study findings will be briefed and capability confirmed that system can meet performance requirements, cost, schedule and risk before Phase II full integration at HITL for the Dynamic DIADS Control of CEESIM (D2C2) to develop a capability to have DIADS drive CEESIM radar engagements in real time vs static, script-based engagements. Adds Pilot-in-the-Loop dynamics to Electronic Warfare (EW) testing.<br>- Initiate Phase ii, developing the System Requirements Specifications (SRS), the cost/benefits analysis design, the functional allocation and integration requirements for the General Threat Torpedo (GTT) to develop a threat torpedo surrogate with upgradable interchangeable segments as an upgrade replacement for the current threat surrogate torpedo.<br>- Project completes for the development of Joint Standard Instrumentation Suite (JSIS) Phase 2 to measure and collect missile attitude (6DOF) as well as signature, TSPI, and related data for a larger portion of the threat man-portable air defense systems (MANPADS) trajectory at the required accuracies within a single firing to support evaluation of the missile/hostile fire warning systems such as the Advance Threat Warning (ATW) system.<br>- Continue work on the Post Intercept Debris Simulation (PIDS) capability that enhances Navy Probability of Raid Annihilation simulator federation with realistic post-missile intercept debris.<br>- Complete development of the Pulsed Doppler Emitter Capability Payload for Aerial Targets (PDEC-163) to develop kinematic threat representations and threat representative emissions to provide the DDG-1000 OT SUT with the ability to collect data necessary for COTF to accredit the DDG-1000's fire control loop weapons system response to threat targets.<br>- Continue the development of Multi-Spectral Sea and Land Target Simulator (MSALTS) Emitter Upgrade to improve MSALTS and Joint Mobile Infrared Countermeasure Test System (JMITS) emitter bandwidth in order to keep up with emerging Systems Under Test (SUT).<br>- Continue the development of Ultra Low-band Time Difference Of Arrival (UT) to develop the capability for a time difference of arrival (TDOA) multi-aircraft test configuration to support three aircraft under test in both the Air Combat Environment Test and the Evaluation Facility (ACETEF) and Electronic Combat Simulation and Evaluation Lab (ECSEL).<br>- Program Management Plan will be provided with technical and programmatic requirements, cost, schedule, and risk for approval of funds to initiate the Battlefield Awareness Testbed (BAT). If approved, the BAT projects primary objective is to support the deployment of Phase I Interim Capability Release of F-35 Interim Full-Motion Video (FMV) test in FY 2020.<br>- A Program Management Plan with technical and programmatic requirements, cost, schedule, and risk for approval of funds to initiate project will be provided for the Maritime Survivability Library (MSL) to develop a weaponeering tool for timely planning and execution of surface warfare strike missions. The T&E community requires a tool to accurately evaluate the lethality of emerging anti-ship weapons for use in acquisition decisions.<br>- A Program Management Plan with technical and programmatic requirements, cost, schedule, and risk for approval of funds to initiate project will be provided for the Non-IP Cybersecurity Suite (NICS) proposes to develop a hardware and software framework to automatically connect to non-IP interfaces, decode non-IP communications protocols, and launch basic non-IP cyberattacks through a Graphical User Interface and a software Application Programming Interface to dramatically accelerates and expands non-IP cybersecurity testing. | | | |

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| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| - A Program Management Plan with technical and programmatic requirements, cost, schedule, and risk for approval of funds to initiate project will be provided for the Tactical Aerospace Laser Optical Simulator – High Altitude (TALOS HIGH). The program intends to develop a dual laser threat simulation capability within a 2-story cryo-vacuum chamber to evaluate space-based ISR sensors against surrogate ground- and air-based laser threats within a simulated space environment.<br>- A Program Management Plan with technical and programmatic requirements, cost, schedule, and risk for approval of funds to initiate project will be delivered for the Towed Array Threat Emulator (TATE) which proposes to develop a modular towed array to support T&E needs. The array will be designed to support receive and transmit nodes defined for the System Under Test (SUT). Each transmit and receive node will deliver raw data to the array tow vehicle for processing and generation of an acoustic or tactical response.<br>- FY20 Congressional Add projects resulting from a Joint DDR&E and DOT&E assessment of T&E infrastructure. Specific projects are identified but per Congressional direction cannot be initiated until briefed to Congressional Defense Committees. Projects are established to address critically needed test capabilities in the following areas.<br>-- Hypersonic Ground Test Infrastructure that develops new capabilities and modernizes existing ground test facilities to test advance materials, sensors, prototype systems and other items in a at hypersonic speeds and environmental conditions.<br>-- Hypersonic Flight Test Infrastructure that develops new capabilities and modernizes existing capabilities that enable testing and coverage throughout the flight envelope of hypersonic systems. This includes areas such as the ground infrastructure to conduct and monitor systems in flight, flight termination systems, advanced telemetry, optical and radar tracking capabilities, impact location and data processing.<br>-- Space Test Infrastructure to ensure T&E against realistic threats and environmental conditions in all segments of space systems including ground and control, orbital and spaceborne and user equipment.<br>-- Directed Energy Test Infrastructure to accurately measure energy on target, characterize beam performance of high energy lasers and high power microwave systems, and simulate representative threats for A-PNT, etc.<br>-- Cyber Test Infrastructure developments to evaluate ground and airborne platforms, internal avionics and data buses, C4ISR systems, and other critical infrastructure against cyber threats.<br>-- Threat Center of Excellence projects to develop, test, and evaluate new technologies and methodologies to counter critical conventional threats posed by traditional and non-traditional adversaries. Projects cover use of quantum technologies in encryption key and position, navigation and timing, ability to test ground systems in GPS denied environments, and development of small UAS threats and counter UAS capabilities to support testing in realistic threat representative battlefield conditions.<br>***FY 2021 Plans:***<br>JIM Projects:<br>- Initiate manufacturing for units 2 and 3 for the Advanced Dynamic Transmitter Array (ADTRA) project to provide a complex, dynamic radio frequency (RF) threat environment at the Benefield Anechoic Facility (BAF) to test advanced aircraft against EW threats. | | | |

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|---|---|---|---|
| - Continue development of Fly-out System and begin development of the Close-in System and Variable Metric Zoom Lens for Advanced Range Tracking and Imaging System (ARTIS) project to provide the next generation of optical tracking mounts on DoD open-air ranges.<br>- Deliver IOC for the Drivetrain Simulator for the Advanced Durability Testing (AVDT) project and continue manufacture of the multi-axle vehicle chassis simulator.<br>- Complete an IOC for the Guardian subproject enabling safe control of UAS in mixed military airspace and IOC for the Navy Manned Unmanned subproject, complete critical design and IOC for the UAS Test Tools and Army Remote MUMT for the Autonomy, Integration and Teaming (AIT) project to develop the capability to safely operate Unmanned and Autonomous aerial vehicles in controlled airspace.<br>- Complete Software Release 2 and continue development for the Autonomous Systems Test Capability (ASTC) DRIVE sub-project. Continue development of the SEER sub-project for the Autonomous Systems Test Capability (ASTC) project that develops test capability for DoD autonomous ground systems.<br>- Complete integration and fielding for the second Closed Loop PESA Simulator (CLPS) at Eglin AFB, FL to provide closed-loop radar systems that replicates the performance of a widely fielded Western Pacific (WESTPAC) long-range surface-to-air missile (SAM) system.<br>- Continue development of the Commercial Derivative Aircraft Based Instrumentation Telemetry System (CBITS) project to provide expanded capability and capacity telemetry support for aircraft and missile defense testing in inter-range and broad ocean area test scenarios.<br>- Continue CLS sustainment for Common Range Integrated Instrumentation System (CRIIS) project that establishes a high dynamic, sub-meter, military standard (MILS) capable range instrumentation system.<br>- Project will transition development from the T&E/S&T Program to CTEIP for the Dense Plasma Focus (DPF) project that that provides very short pulse neutron effects test capability for certification and survivability testing of new circuit card designs.<br>- Continue development of the Direct Inject Electro-Optical-Infrared System (EO-IR). This proposal provides a test capability for high speed, coordinated EO/IR sensor stimulation to ensure comprehensive testing of sensor fusion algorithms for aircraft and helicopters.<br>- Field capability for the Direct Inject Jammer Common Operating Picture (DIJCOP) project that provides real-time awareness, data collection and analysis of DIJ health, status and geolocation information for both White and Red Cell operations at JRTC, Ft Polk, LA and JMRC, Hohenfels, Germany.<br>- Delivery of first set of HEU rings to White Sands Missile Range for the Fast Burst Reactor Upgrade (FBRU) project that replaces the Highly Enriched Uranium HHEU) fuel for the existing FBR with new fuel (seven rings and two safety blocks) to test missile components to required levels of short-pulse neutrons simulating Nuclear Weapons Effects.<br>- Field a high power variant with Army procuring remaining units for the Global Position System Localized EW Emitter (GPS LEWE) project to provide low energy, vehicle mounted GPS jamming capability for testing of ground vehicle communications and navigation systems against GPS jamming. | | | |

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| - Complete testing and achieve Final Operational Capability of the snow and ice components of G-Range Weather Effects project that upgrades the three inch test track at AEDC to provide a small scale dust, rain, and snow erosion test capability. Continue development of the eight inch track capability.<br>- Complete testing and achieve Final Operational Capability of the Holloman AFB High Speed Test Track upgrade to provide full scale rain erosion capability to validate vehicle structural designs and qualify hypersonic weapon systems for flight in an open air environment.<br>- Continue fabrication and test activities for the Hypersonic Test Capability Improvement Project (Phoenix) to provide a clean air, variable Mach ground test capability for hypersonic system prototypes from Mach 4 to Mach 7.5. Complete installation on five of the six major subsystems.<br>- Continue project and initiate follow-on development efforts for the Joint Electronic Warfare T&E Study (JETS) developed a high level follow-on investment strategy to the 2010 Tri-Service EW Test Capability Study (TEWTCS) to maintain and advance air superiority as a critical component of EW Air Dominance and the National Defense Strategy.<br>- Enable future efficiencies for Edwards, Nellis and within the JSF program (which now includes a system at Patuxent River NAS) for the Joint Strike Fighter Knowledge Management, Big Data Analytics project establishes next-generation big data analytics and knowledge management capabilities utilizing the latest in virtualization technologies, methodologies, and best practices for efficient and effective use of T&E data.<br>- Continue development of Mobile High Energy Laser Measurement (MHELM) sub-projects developing target boards for various surrogate threat vehicles, measuring reflected irradiance, and developing software tools.<br>- Complete Critical Design Review for the Mission System Test Capability (MSTC) project that develops the capability to support integration and interoperability testing for advanced 5th generation aircraft data links in a ground test, simulation environment.<br>- Complete assembly and testing for the Mid-Pressure Arc Heater (MPAH) project that expands the H2 Hypersonic Test Facility at Arnold Engineering Development (AEDC) Complex, TN to provide higher enthalpy at the mid-pressure altitudes to enable ground materials testing of components of hypersonic systems. Additionally start development of Increment 2 providing an additional power supply for longer run times and larger test articles to support thermal protection system testing of hypersonic boost glide vehicles and other systems.<br>- Continue development of the M&S for Weather Effects on Hypersonic Systems project that provides a database of realistic and relevant weather conditions as a basis for ground test requirements, and develops advanced material response models validated with improved ground test data to predict weather erosion in flight.<br>- Complete integration at the BAF for the Next Generation Electronic Warfare Environment Generator (NEWEG) Build B project that provides advanced electronic warfare simulation/stimulation capabilities for testing future Electronic Attack and Electronic Support Measures systems at multiple DoD test facilities and reprogramming laboratories.<br>- Complete FY2020 projects and initiate additional cyber developments for the Non-Internet Protocol Cyber Test Tools is a portfolio of projects to provide cyber test tools required to evaluate cyber security of weapon systems components, data links, communications buses and other critical items. | | | |

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| - Complete design and continue development of the Open-Air Multi-Spectral Data Collection (OAMSDC) that provides enhanced IR missile signature open air data collections processes; provides conduits for playback of observed IR missile shots to an open air missile plume simulator; provide multi-mode (RF + IR) threat missile presentations to systems under test; and a Joint Multispectral Target Board (JMTB).<br>- Continue development of the Ordnance Evaluation Range, Detonation Chamber to provide the ability of measuring hypersonic components to survive varying temperatures, vibrations, and acoustic stresses.<br>- Continue development of the Over Water Scoring System that provides persistent, relocatable range capability for open-ocean, high precision weapon scoring and range surveillance based on a “Waveglider” platform and processing software prototyped by the 96th Test Support Squadron, Eglin AFB.<br>- Continue development of the ADAMS-3 radar facility at ATR. Complete development of Semi-automated target rollover subproject that completes all capability upgrades at the NRTF for the Radar Cross Section Range Relevance (RCSRR) project comprised of 11 subprojects that upgrade radar cross section (RCS) capabilities at both the National Radar Cross Section (RCS) Test Facility (NRTF), Holloman AFB, NM, and the Atlantic Test Range (ATR), NAS Patuxent River, MD to improve infrastructure to ensure test measurement capabilities and throughput capacities at both ranges are sufficient to measure and evaluate advanced low observable technologies.<br>- Continue development of the air-to-air and advanced signal blocks of the Radar Air-to-Ground Environment (RAGE) project. Complete design of the air-to-ground block.<br>- Efforts determined in late FY2020 for FY2021 consideration for the Range Commander’s Council Technical Group projects. The RCC Technical Groups manage inter-range policies and procedures.<br>- Continue development of the Reconfigurable RF Target Simulator (RRFTS) project to upgrade an Eglin AFB facility to test prototype sensors in a simulated hypersonic target and scene environment.<br>- Continue participation in the Spectrum Incentives Working Group, International Consortium for Telemetry Spectrum, DoD and other spectrum groups for the Spectrum Stewardship project that ensures DoD T&E spectrum concerns are addressed in domestic and international forums establishing policies related to issues such as spectrum management, frequency allocations, and spectrum interference that impact DoD test and evaluation ranges.<br>- Field the final IT system and transition to the Services for sustainment for the Technology Development Acquisition Program Next Generation (TDAP NGEN) project that implements a new set of IT tools to support the T&E Board of Directors Reliance Process in order to receive, review and prioritize Service test and evaluation gaps and development proposals.<br>- Additional proposals will be considered for work for the Threat Center of Excellence project that provides research, evaluate new technologies and methodologies to counter critical conventional threats posed by traditional and non-traditional adversaries focused initially on the Cyber, EW, and small UAS threats.<br>- Continue the development of the Transient Thermal Analysis Software (TTAS) project that provides improved capabilities for predicting aerothermal and ablation response to high speed, high temperature flow in ground and flight test environments. | | | |

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| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| - Continue the UAV Range (UAV Range) project development in coordination with associated T&E/S&T Program efforts for the Unmanned Aerial Vehicle (UAV) Range project to provide Global Hawk UAVs equipped with telemetry, Light Detection and Ranging System (LIDAR) and optical tracking for inflight data collection of hypersonic systems.<br>- Continue the development completing design reviews and initiating construction for the X-Ray Simulators for Test and Evaluation of Nuclear Survivability (XSTENS) project to replace or upgrade three X-ray simulators that measure the susceptibility of missile components to damage from high dose warm and cold x-rays experienced in space.<br>- Complete ESP resulting in specific nominations for FY2022 CTEIP New Start projects for CTEIP development proposals recommended by Service Test and Evaluation Executives.<br><br>Resource Enhancement Projects:<br>- Complete development of Advanced Communication Threat Testing Suites (ACTTS) Uplink Capability to develop an electronic warfare (EW) threat representative uplink jamming system to support test and evaluation of end-to-end satellite system responsiveness to threat systems operating in applicable bands.<br>- Completes and will deliver the capability to Naval Air Warfare Center Weapons Division (NAWCWD) for use in Verification & Validation DIADS and Airborne Electronic Attack (AEA) LVC testing. AWBS will improve air-to-air range infrastructure for NAWC-WD for the Airborne Early Warning Interoperability Simulator (AEIS) project develops the hardware and software necessary to generate a properly spaced, dense target and Electronic Counter Measure (ECM) environment for injection-mode Installed Systems Test Facility (ISTF) testing.<br>- Complete the development of additional enhancements to Air Warfare Battle Shaping (AWBS) investments to improve air-to-air range infrastructure for NAWC-WD.<br>- Complete development of General Threat Torpedo (GTT) to develop a threat torpedo surrogate with upgradable interchangeable segments as an upgrade replacement for the current threat surrogate torpedo.<br>- Complete development of Post Intercept Debris Simulation (PIDS) to enhances Navy Probability of Raid Annihilation simulator federation with realistic post-missile intercept debris.<br>- Capability delivery to Pt. Mugu, CA to support the DDG-1000 OIT&E for the Pulsed Doppler Emitter Capability Payload for Aerial Targets (PDEC-163).<br>- Complete the development of Multi-Spectral Sea and Land Target Simulator (MSALTS) Emitter Upgrade to improve MSALTS and Joint Mobile Infrared Countermeasure Test System (JMITS) emitter bandwidth in order to keep up with emerging System Under Test (SUT).<br>- Complete the development of Ultra Low-band Time Difference Of Arrival (UT) to develop the capability for a time difference of arrival (TDOA) multi-aircraft test configuration to support three aircraft under test in both the Air Combat Environment Test and the Evaluation Facility (ACETEF) and Electronic Combat Simulation and Evaluation Lab (ECSEL). | | | |
| ***FY 2020 to FY 2021 Increase/Decrease Statement:*** | | | |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 6: *RDT&E Management Support* | **R-1 Program Element (Number/Name)**<br>PE 0604940D8Z *I Central Test and Evaluation Investment Program (CTEIP)* |

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Department Program Adjustments. Increased investments for high-priority hypersonic ground and open air range test capability developments and increased investments for critically needed upgrades to DoD Threat Models and Simulations.<br>Joint Electronic Warfare Test Initiatives FY21-25 are projects on a DoD approved investment roadmap resulting from the JETS study that identified vital test capabilities needed in order to maintain and advance air superiority as a critical component of EW Air Dominance and the National Defense Strategy. Initial investment projects develop and field the RF threat emulation systems needed to keep up with evolving advanced, sophisticated threats to support planned MRTFB open air range test events. The investment roadmap also incorporates multi-year initiatives to provide expanded land range coverage enabling airborne participants to operate seamlessly across test or training ranges and initiatives to develop the aircraft and ground instrumentation, distributed LVC simulation environments, data collection and processing to enable interoperability across multiple ranges and platforms. | | | |
| **Accomplishments/Planned Programs Subtotals** | 264.179 | 390.692 | 422.451 |

**D. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**E. Acquisition Strategy**

N/A

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support* | **R-1 Program Element (Number/Name)**<br>PE 0604942D8Z / *Assessments & Evaluations* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 226.428 | 30.138 | 30.834 | 18.379 | - | 18.379 | 18.524 | 17.725 | 17.714 | 17.899 | Continuing | Continuing |
| 805: *Assessments & Evaluations* | 226.428 | 15.201 | 16.431 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| 822: *Director, Special Programs (DSP)* | 0.000 | 2.668 | 5.040 | 10.246 | - | 10.246 | 10.305 | 10.376 | 10.488 | 10.594 | Continuing | Continuing |
| 823: *National Assessment Group (NAG)* | 0.000 | 12.269 | 9.363 | 8.133 | - | 8.133 | 8.219 | 7.349 | 7.226 | 7.305 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

This program is reported in accordance with Title 10, United States Code, Section 119(a)(1) in the Special Access Program Annual Report to Congress. For further information, please contact the Director of Special Programs, OUSD(A&S)/DSP.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 31.285 | 30.834 | 23.228 | - | 23.228 |
| Current President's Budget | 30.138 | 30.834 | 18.379 | - | 18.379 |
| Total Adjustments | -1.147 | 0.000 | -4.849 | - | -4.849 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | 0.000 | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | -1.142 | - | | | |
| • Decrease for establishment of new R&E PE due to reorganization | - | - | -12.280 | - | -12.280 |
| • Other Program Adjustments | - | - | 7.058 | - | 7.058 |
| • Cancelled Accounts | -0.005 | - | - | - | - |
| • Economic Assumption | - | - | -0.019 | - | -0.019 |
| • Defense Wide Review Adjustment | - | - | -1.008 | - | -1.008 |
| • Classified Increase | - | - | 1.400 | - | 1.400 |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support* | **R-1 Program Element (Number/Name)**<br>PE 0604942D8Z / *Assessments & Evaluations* |

**Change Summary Explanation**

The $12.280 million decrease is the result of a functional transfer from the Special Access Program from OUSD(A&S) PE 0604929D8Z/P805 to OUSD(R&E) 0603527D8Z/P527.

The $7.058 million increase is the result of the planned program changes to execute the Special Programs Assessments requirements in OUSD(A&S).

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 6 | R-1 Program Element (Number/Name)<br>PE 0604942D8Z / *Assessments & Evaluations* | Project (Number/Name)<br>805 / *Assessments & Evaluations* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 805: *Assessments & Evaluations* | 226.428 | 15.201 | 16.431 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

This program is reported in accordance with Title 10, United States Code, Section 119(a)(1) in the Special Access Program Annual Report to Congress. For further information, please contact the Director of Special Programs, OUSD(A&S)/DSP.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Assessments & Evaluations | 15.201 | 16.431 | 0.000 |
| ***Description:*** Detailed Information is Classified.<br><br>***FY 2020 Plans:***<br>Detailed information is Classified.<br><br>***FY 2021 Plans:***<br>Detailed information is Classified.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Details are Classified. | | | |
| **Accomplishments/Planned Programs Subtotals** | 15.201 | 16.431 | 0.000 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 6 | R-1 Program Element (Number/Name)<br>PE 0604942D8Z / *Assessments & Evaluations* | Project (Number/Name)<br>822 / *Director, Special Programs (DSP)* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 822: *Director, Special Programs (DSP)* | 0.000 | 2.668 | 5.040 | 10.246 | - | 10.246 | 10.305 | 10.376 | 10.488 | 10.594 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

Classified Program.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Director, Special Program | 2.668 | 5.040 | 10.246 |
| ***Description:*** Detailed Information is Classified.<br><br>***FY 2020 Plans:***<br>Detailed information is Classified.<br><br>***FY 2021 Plans:***<br>Detailed information is Classified.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Details are Classified. | | | |
| **Accomplishments/Planned Programs Subtotals** | 2.668 | 5.040 | 10.246 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 6 | R-1 Program Element (Number/Name)<br>PE 0604942D8Z / *Assessments & Evaluations* | Project (Number/Name)<br>823 / *National Assessment Group (NAG)* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 823: *National Assessment Group (NAG)* | 0.000 | 12.269 | 9.363 | 8.133 | - | 8.133 | 8.219 | 7.349 | 7.226 | 7.305 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

Classified program.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** National Assessment Group (NAG) | 12.269 | 9.363 | 8.133 |
| ***Description:*** Detailed information is Classified.<br><br>***FY 2020 Plans:***<br>Detailed information is Classified.<br><br>***FY 2021 Plans:***<br>Detailed information is Classified.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Details are Classified. | | | |
| **Accomplishments/Planned Programs Subtotals** | 12.269 | 9.363 | 8.133 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support* | **R-1 Program Element (Number/Name)**<br>PE 0605100D8Z / *Joint Mission Environment Test Capability (JMETC)* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 258.262 | 88.004 | 89.091 | 79.046 | - | 79.046 | 80.101 | 84.448 | 85.676 | 87.390 | Continuing | Continuing |
| 087: *JMETC Distributed Test* | 178.460 | 16.558 | 15.157 | 14.819 | - | 14.819 | 15.279 | 15.950 | 16.402 | 16.730 | Continuing | Continuing |
| 088: *JMETC National Cyber Range (NCR) Complex* | 79.802 | 71.446 | 73.934 | 64.227 | - | 64.227 | 64.822 | 68.498 | 69.274 | 70.660 | Continuing | Continuing |

**Note**

Project 100 Activities realigned under Project 88: JMETC National Cyber Range (NCR) Complex.

**A. Mission Description and Budget Item Justification**

The Joint Mission Environment Test Capability (JMETC) program provides a Department of Defense (DoD) enterprise-wide test capability to support system-to-system interoperability testing, mission-level environment testing, and cyber event operations, including cyber testing, cyber training, cyber experimentation, and cyber mission rehearsal. The JMETC program implements the infrastructure capabilities defined in the DoD "Testing in a Joint Environment Roadmap" to provide acquisition program managers a robust nation-wide capability to "test like we fight." The JMETC program provides a persistent, distributed test and evaluation (T&E) capability that supports system development to measure and improve interoperability performance and cyber resiliency, which otherwise would not be readily available to Service/Component acquisition programs. The JMETC program is funded within the Research, Development, Test and Evaluation (RDT&E) Management Support Budget Activity because it provides test capability in support of RDT&E programs. By linking distributed facilities, as well as providing the necessary tools, services and subject matter expertise, the JMETC program allows acquisition programs to efficiently evaluate their warfighting capability in a realistic joint mission environment. The JMETC Program has been aligned to advance the National Defense Strategy (NDS), to test the development of resilient, survivable, federated networks and information ecosystems from the tactical level up to strategic planning, as well as test and assess cyber defenses, building a more lethal force.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 88.184 | 83.091 | 79.125 | - | 79.125 |
| Current President's Budget | 88.004 | 89.091 | 79.046 | - | 79.046 |
| Total Adjustments | -0.180 | 6.000 | -0.079 | - | -0.079 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | 6.000 | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | -0.165 | - | | | |
| • Other Adjustments | -0.015 | - | - | - | - |
| • Economic Assumptions | - | - | -0.079 | - | -0.079 |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 6: *RDT&E Management Support* | **R-1 Program Element (Number/Name)**<br>PE 0605100D8Z *I Joint Mission Environment Test Capability (JMETC)* |

**Change Summary Explanation**

FY 2019: Congressional add of $4.000 million provided in Department of Defense Appropriation Bill (P.L. 115-245) accommodates a program increase, to include funding for cyber range capability and development. All additional funds included in Project 088 Joint Mission Environment Test Capability National Cyber Range (NCR) Complex.

FY 2020: Congressional add of $6.000 million is for a JMETC program increase.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 6 | R-1 Program Element (Number/Name)<br>PE 0605100D8Z / *Joint Mission Environment Test Capability (JMETC)* | Project (Number/Name)<br>087 / *JMETC Distributed Test* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 087: *JMETC Distributed Test* | 178.460 | 16.558 | 15.157 | 14.819 | - | 14.819 | 15.279 | 15.950 | 16.402 | 16.730 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

The Joint Mission Environment Test Capability (JMETC) program provides a Department of Defense (DoD) enterprise-wide test capability to support system-to-system interoperability testing, mission-level environment testing, and cyber event operations, including cyber testing, cyber training, cyber experimentation, and cyber mission rehearsal. The JMETC program implements the infrastructure capabilities defined in the DoD "Testing in a Joint Environment Roadmap" to provide acquisition program managers a robust nation-wide capability to "test like we fight." The JMETC program provides a persistent, distributed test and evaluation (T&E) capability that supports system development to measure and improve interoperability performance and cyber resiliency, which otherwise would not be readily available to Service/Component acquisition programs. The JMETC program is funded within the Research, Development, Test and Evaluation (RDT&E) Management Support Budget Activity because it provides test capability in support of RDT&E programs. By linking distributed facilities, as well as providing the necessary tools, services and subject matter expertise, the JMETC program allows acquisition programs to efficiently evaluate their warfighting capability in a realistic joint mission environment. The JMETC Program has been aligned to advance the National Defense Strategy (NDS), to test the development of resilient, survivable, federated networks and information ecosystems from the tactical level up to strategic planning, as well as test and assess cyber defenses, building a more lethal force.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** JMETC Distributed Test | 16.558 | 15.157 | 14.819 |
| ***Description:*** The JMETC Distributed Test project continued expansion of the JMETC Secret Network (JSN) infrastructure to meet requirements.<br>The JMETC Distributed Test project supported DoD distributed test and training events to include: system interoperability certification; system interoperability assessments; command and control systems; air and missile defense; 5th Generation Aircraft; unmanned aircraft; precision-guided bombs; munitions; missile tracking and guidance; infrared countermeasures; Joint Fires; Joint Close Air Support; and coalition exercises.<br>The JMETC Distributed Test project provided test planning support to users and organizations to conduct interoperability testing on numerous DoD systems including: command and control systems; information warfare; air and missile defense; intelligence, surveillance, and sensor systems; surface ships; anti-surface warfare; anti-submarine warfare; tactical radar systems; precision-guided bombs; unmanned aircraft; autonomous aircraft; manned fixed wing aircraft; helicopters; and business systems.<br>The JMETC Distributed Test project provided strategic planning efforts to engage new acquisition programs that must demonstrate compliance with Net-Ready Key Performance Parameter.<br>The JMETC Distributed Test project assisted customers with the use of distributed test tools and troubleshooting of the end-to-end network infrastructures. In addition, the JMETC team provided on-site support for the execution of large-scale, complex distributed events. | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0605100D8Z / *Joint Mission Environment Test Capability (JMETC)* | **Project (Number/Name)**<br>087 / *JMETC Distributed Test* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| The JMETC Distributed Test project updated the Data Architecture Reference Document (ARD) and investment roadmap that codifies needs and resource requirements for adopting an enterprise approach to T&E Knowledge Management and Big Data Analytics.<br><br>***FY 2020 Plans:***<br>The JMETC Distributed Test project will continue to optimize the JMETC Secret Network (JSN) infrastructure to meet requirements, adding additional sites to meet requirements.<br>The JMETC Distributed Test project will continue supporting DoD distributed test and training events to include: system interoperability certification; system interoperability assessments; command and control systems; air and missile defense; 5th Generation Aircraft; unmanned aircraft; precision-guided bombs; munitions; missile tracking and guidance; infrared countermeasures; Joint Fires; Joint Close Air Support; and coalition exercises.<br>The JMETC Distributed Test project will continue providing test planning support to users and organizations to conduct interoperability testing on numerous DoD systems including: command and control systems; information warfare; air and missile defense; intelligence, surveillance, and sensor systems; surface ships; anti-surface warfare; anti-submarine warfare; tactical radar systems; precision-guided bombs; unmanned aircraft; autonomous aircraft; manned fixed wing aircraft; helicopters; and business systems.<br>The JMETC Distributed Test project will continue to assist customers with the use of distributed test tools and troubleshooting of the end-to-end network infrastructures. In addition, the JMETC team will provide on-site support for the execution of large-scale, complex distributed events.<br>The JMETC Distributed Test project will expand post-test enterprise service capabilities, to include Knowledge Management and Big Data Analytics tools and technologies, in support of JMETC customer needs and requirements.<br><br>***FY 2021 Plans:***<br>The JMETC Distributed Test project will continue to optimize the JMETC Secret Network (JSN) infrastructure to meet requirements, adding or removing sites as necessary.<br>The JMETC Distributed Test project will continue supporting DoD distributed test and training events.<br>The JMETC Distributed Test project will continue providing test planning support to users and organizations to conduct interoperability testing on numerous DoD systems.<br>The JMETC Distributed Test project will continue to assist customers with the use of distributed test tools and troubleshooting of the end-to-end network infrastructures. In addition, the JMETC team will provide on-site support for the execution of large-scale, complex distributed events.<br>The JMETC Distributed Test project will continue to modernize post-test enterprise service capabilities, to include Knowledge Management and Big Data Analytics tools and technologies, in support of JMETC customer needs and requirements. | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0605100D8Z / *Joint Mission Environment Test Capability (JMETC)* | **Project (Number/Name)**<br>087 / *JMETC Distributed Test* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| The JMETC Distributed Test project will continue to support new and emerging acquisition programs.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Program Adjustments | | | |
| **Accomplishments/Planned Programs Subtotals** | 16.558 | 15.157 | 14.819 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 6 | R-1 Program Element (Number/Name)<br>PE 0605100D8Z / *Joint Mission Environment Test Capability (JMETC)* | Project (Number/Name)<br>088 / *JMETC National Cyber Range (NCR) Complex* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 088: *JMETC National Cyber Range (NCR) Complex* | 79.802 | 71.446 | 73.934 | 64.227 | - | 64.227 | 64.822 | 68.498 | 69.274 | 70.660 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

The National Cyber Range Complex (NCRC) is comprised of cyber ranges and a secure distributed network infrastructure to service the cyber range user community. The NCRC currently consists of five functional cyber ranges, including the National Cyber Range in Florida as well as four Regional Service Delivery Points (RSDP) located in Hawaii, Alabama, Maryland, and Massachusetts. To enhance DoD cyber range test and training capability and capacity, the NCRC is being expanded with additional cyber ranges co-located with key Service organizations to support an increase of cyber testing of DoD systems as well as training of cyber warfighters. The JMETC Multiple Independent Level of Security (MILS) Network (JMN) currently links 58 sites across the DoD, industry, and academia, providing secure access between cyber ranges, laboratories, and facilities. Both the cyber ranges and the network infrastructure are accredited to support multiple levels of security classifications, specifically configured to meet particular cyber event requirements. The NCRC investments have been aligned to support the National Defense Strategy in improving cyber defense, cyber resilience, and the continued integration of cyber capabilities into the full spectrum of military operations.

The NCRC conducts cyberspace test and training events for the full spectrum of DoD customers including research, development, acquisition, testing, training and operational Cyber Mission Forces (CMF). The NCRC executes wide variety of event types including science and technology (S&T) demonstrations, developmental test and evaluation (DT&E), operational test and evaluation (OT&E), security controls assessments, cyberspace operations training, refinement of cyberspace tactics, techniques, and procedures (TTP) Development, forensics/malware analysis) and cyberspace operations mission rehearsal. The NCRC enables acquisition programs to conduct cybersecurity test and evaluation in an operationally representative cyberspace environment enabling identification, validation and mitigation of vulnerabilities. The NCRC also supports training, mission rehearsal and certification of the CMF in support of US Cyber Command by enabling operational forces to efficiently evaluate cyber warfighting capability in a realistic joint mission environment.

The NCRC provides secure facilities, technology, processes, and workforce to rapidly create hi-fidelity, mission-representative friendly, neutral, and adversarial cyberspace environments.

The NCRC also facilitates integration of distributed organizations with different missions and workforce relevant to cyber operations (e.g., cyber operators, penetrations testers, cyber assessors, cyber observers, cyber analysts, etc.). The NCRC supports cyber activities across of a full spectrum of DoD systems, including weapon platforms, C4I systems, business systems, network devices, and other systems vulnerable to a cyber-attack. The NCRC extensively utilizes automation to minimize human error, to reduce the time required to set-up for a cyber event, and to ensure repeatable results. In addition, the NCRC employs post-event sanitization techniques on all assets after exposure to malicious code to restore back to a known, clean state, which allows for reuse in future events.

The NCRC has a multidisciplinary workforce with software, systems, network, virtualization, automation, system administration, and cybersecurity subject matter expertise. In support of successful planning and execution of hosted events, the NCRC workforce helps users define and refine their event objectives, assists with identifying and prioritizing potential vulnerabilities, designs virtualized cyber environments, develops customized traffic generation and instrumentation solutions, integrates 3rd party hardware and software, executes cyber events on behalf of the user, provides cooperative vulnerability and penetration assessments, performs detailed cyber analysis, and delivers detailed reports on the results. In addition, the NCRC workforce supports both the Executive Agent for Cyber Test Ranges and

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0605100D8Z / *Joint Mission Environment Test Capability (JMETC)* | **Project (Number/Name)**<br>088 / *JMETC National Cyber Range (NCR) Complex* |

the Executive Agent for Cyber Training Ranges, to identify and address relevant needs, define and promulgate standards, and seek efficiencies through focused investments.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** JMETC National Cyber Range (NCR) Complex | 71.446 | 73.934 | 64.227 |
| ***Description:*** The NCRC continued support for hundreds of cyber events, providing cybersecurity T&E support to Major Defense Acquisition Programs (MDAP), Major Automated Information Systems (MAIS) Acquisition Programs, and smaller acquisition programs.<br>The NCRC continued support for cyber testing of systems and subsystems across multiple domains (land, air, sea, and space) relevant to manned and unmanned aircraft, surface ships, command and control systems, data management platforms, weapons platforms, satellites, radars, and missile defense systems.<br>The NCRC continued support to Service Cyber Mission Forces (CMF) with training, certification, mission rehearsal and TTP development focused events.<br>The NCRC continued support to numerous DoD organizations in cyber activities, including US Cyber Command; Joint Staff J-7; Director, Operational Test & Evaluation (DOT&E); Director, Developmental Test & Evaluation (DT&E); Army PEO Command Control Communications Tactical (PEO C3T); Naval Air Systems Command (NAVAIR); Naval Information Warfare Systems Command (NAVWARSYSCOM); Naval Sea Systems Command (NAVSEA); PEO Ships; Air Force Space and Missile Command; Army Intelligence and Information Warfare Directorate; Office of Naval Intelligence; Marine Corps Tactical Systems Support Activity; the Army Combat Capabilities Development Command (CCDC) C5ISR Center; and several partner nations.<br><br>***FY 2020 Plans:***<br>The NCRC will continue to implement improvements needed to increase capacity and support increased demand at the current and future cyber ranges.<br>The NCRC will continue to build out additional dedicated Persistent Testing and Training Environments to support testing and training customers.<br>The NCRC will continue to operate in support of the growing acquisition program cybersecurity T&E requirements.<br>The NCRC will continue to provide Cyber Table Top support for acquisition programs to help assess and address cyber security as early as possible in development.<br>The NCRC will continue to provide support to US Cyber Command, Joint Staff, and other training and certification events by developing representative blue, red and gray environments.<br>The NCRC will continue to support DOT&E cyber assessments.<br>The NCRC will continue to support US Cyber Command cyber activities.<br>The NCRC will continue to expand testing of Industrial Control Systems and Avionics Systems test beds.<br>The NCRC will increase capacity by establishing additional cyber ranges in support of both cyber T&E and training requirements. | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0605100D8Z / *Joint Mission Environment Test Capability (JMETC)* | **Project (Number/Name)**<br>088 / *JMETC National Cyber Range (NCR) Complex* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| The NCRC will conduct engineering activities to plan for technical refresh of emerging end of life and end of service computing assets.<br>The NCRC will continue to assess cyber range requirements in close cooperation with the Executive Agents for Cyber Test Ranges and Cyber Training Ranges to build priority cyber range capability and capacity to meet identified RDT&E community and CMF needs.<br>The NCRC will continue analyses of capability to determine requirements and standards needed to join these cyber test facilities with existing acquisition system hardware-in-the-loop, software-in-the-loop, and systems integration laboratories to test systems in a realistic cyber contested environment.<br>The NCRC will continue to expand the JMN connectivity as needed to provide access to cyber range resources. | | | |
| ***FY 2021 Plans:***<br>The NCRC will continue to implement improvements needed to increase capacity and support increased demand at the current and future cyber ranges.<br>The NCRC will continue to build out additional dedicated Persistent Testing and Training Environments to support testing and training customers.<br>The NCRC will continue to operate in support of the growing acquisition program cybersecurity T&E requirements.<br>The NCRC will continue to provide Cyber Table Top support for acquisition programs to help assess and address cyber security as early as possible in development.<br>The NCRC will continue to provide support to US Cyber Command, Joint Staff, and other training and certification events by developing representative blue, red and gray environments.<br>The NCRC will continue to support DOT&E cyber assessments.<br>The NCRC will continue to support US Cyber Command cyber activities.<br>The NCRC will increase capacity by establishing additional cyber ranges in support of both cyber T&E and training requirements.<br>The NCRC will conduct engineering activities to plan for technical refresh of emerging end of life and end of service computing assets.<br>The NCRC will continue to assess cyber range requirements in close cooperation with the Executive Agents for Cyber Test Ranges and Cyber Training Ranges to build priority cyber range capability and capacity to meet identified RDT&E community and CMF needs.<br>The NCRC will continue analyses of capability to determine requirements and standards needed to join these cyber test facilities with existing acquisition system hardware-in-the-loop, software-in-the-loop, and systems integration laboratories to test systems in a realistic cyber contested environment.<br>The NCRC will continue to expand the JMN connectivity as needed to provide access to cyber range resources. | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0605100D8Z / *Joint Mission Environment Test Capability (JMETC)* | **Project (Number/Name)**<br>088 / *JMETC National Cyber Range (NCR) Complex* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Initiate new cyber range capability and development to directly address United States Army Cyber Command test and training needs.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Program Adjustments | | | |
| **Accomplishments/Planned Programs Subtotals** | 71.446 | 73.934 | 64.227 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support* | **R-1 Program Element (Number/Name)**<br>PE 0605104D8Z / *Technical Studies Support and Analysis* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 174.883 | 21.281 | 18.079 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 214.243 |
| 421: *Technical Studies* | 174.883 | 21.281 | 18.079 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 214.243 |

**A. Mission Description and Budget Item Justification**

This program is a key source of funding for the Office of the Secretary of Defense (OSD) to manage studies, analyses, strategic planning, and technical support efforts to improve and support policy development, decision making, management and administration of DoD programs and activities. Studies and analyses are predominantly performed by independent sources outside of the government such as universities, Federally Funded Research and Development Centers, and other private not-for-profit sources. Research requirements will examine current and alternative policies, plans, operations, strategies and budgets, providing essential means for managing and responding to the shifting and complex international, political, technological, economic, military, and acquisition environments in which national security planning decisions are made. Independent analyses from subject matter experts are instrumental for senior defense planners in making informed choices regarding requirements for force planning and strategic deployment of assets taking into account technological challenges and resource constraints, and there is a strong need to incorporate the findings of operational analysis in force planning requirements and projections. With the complexities of present and emerging advanced security threats in the current geopolitical environment, these investments in knowledge to inform senior leadership and support planning for the mid and long-term is vital to remaining strategically competitive.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 22.525 | 18.079 | 18.255 | - | 18.255 |
| Current President's Budget | 21.281 | 18.079 | 0.000 | - | 0.000 |
| Total Adjustments | -1.244 | 0.000 | -18.255 | - | -18.255 |
| • Congressional General Reductions | 0.000 | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | -0.500 | - | | | |
| • SBIR/STTR Transfer | -0.740 | - | | | |
| • Funding realigned to other budget lines for studies | - | - | -5.985 | - | -5.985 |
| • Cancelled Accounts | -0.004 | - | - | - | - |
| • Defense Wide Review | - | - | -12.270 | - | -12.270 |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 6: *RDT&E Management Support* | **R-1 Program Element (Number/Name)**<br>PE 0605104D8Z *I Technical Studies Support and Analysis* |

**Change Summary Explanation**

This program was reduced by $12.270 million dollars as a result of the FY 2021 Defense Wide Review (DWR). The DWR focused on the Secretary's guidance to streamline operations, increase efficiency, and promote greater affordability within the OSD and Defense Agencies and Field Activities in order to ensure the Department's optimum alignment to the National Defense Strategy and DoD strategic guidance, with particular focus on building a more lethal, resilient, agile, and ready force while strengthening alliances, prioritizing cyber and space capabilities, and focusing on innovation to maintain the technological advantage."

An additional reduction in program funds in the amount of $5.985 million reflects realignment of budget authority to other programs for studies and analyses within the Office of the Under Secretary of Defense for FY 2021 and beyond.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 6 | R-1 Program Element (Number/Name)<br>PE 0605104D8Z / *Technical Studies Support and Analysis* | Project (Number/Name)<br>421 / *Technical Studies* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 421: *Technical Studies* | 174.883 | 21.281 | 18.079 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 214.243 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

This program is a key source of funding for the Office of the Secretary of Defense (OSD) to manage studies, analyses, strategic planning, and technical support efforts to improve and support policy development, decision making, management and administration of DoD programs and activities. Studies and analyses are predominantly performed by independent sources outside of the government such as universities, Federally Funded Research and Development Centers, and other private not-for-profit sources. Research requirements will examine current and alternative policies, plans, operations, strategies and budgets, providing essential means for managing and responding to the shifting and complex international, political, technological, economic, military, and acquisition environments in which national security planning decisions are made. Independent analyses from subject matter experts are instrumental for senior defense planners in making informed choices regarding requirements for force planning and strategic deployment of assets taking into account technological challenges and resource constraints, and there is a strong need to incorporate the findings of operational analysis in force planning requirements and projections. With the complexities of present and emerging advanced security threats in the current geopolitical environment, these investments in knowledge to inform senior leadership and support planning for the mid and long-term is vital to remaining strategically competitive.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Technical Studies and Analyses Support for the Office of the Secretary of Defense (OSD) | 21.281 | 18.079 | 0.000 |

***FY 2020 Plans:***

Technical Support for the USD(Acquisition and Sustainment):
Studies and analyses of:

Readiness of major weapons systems, strategic capabilities modernization, software development and sustainment capabilities, countering weapons of mass destruction, artificial intelligence and autonomous systems, digital engineering implementation strategies, mitigating defense acquisition program risk, foreign defense acquisition, manufacturing and supply chain integration, depot operations readiness, global defense industry developments, strategic basing requirements, strengthening allied defense capabilities, DoD installations planning, supply chain and energy source protection, contract financing effects, performance of other transaction authority, effectiveness of technology transfer from small businesses, and methods to sustain small business and non-traditional industrial sources.

Technical Support for the Director, Cost Assessment and Program Evaluation:
Studies and analyses regarding the following areas:

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0605104D8Z / *Technical Studies Support and Analysis* | **Project (Number/Name)**<br>421 / *Technical Studies* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Various analytic requirements for maintaining a balanced portfolio of defense capabilities through investment and resource planning such as emerging strategic and tactical systems requirements, developing innovative operational concepts, joint lethality in contested environments, mobility and logistical support capabilities, maintaining force readiness and personnel planning requirements, capability planning resulting from scenario analyses, contingency and conventional force requirements, technical studies and analyses to support independent cost estimates and economic research, and continuation of development of critical management instruments for measuring the long-term trends, strength and affordability of the defense program and supporting development of the Future Years Defense Program.<br><br>Technical Support for the USD(Policy):<br>Studies, analyses, and activities in the following areas:<br><br>Requirements regarding national security geopolitical posture and policies such as regional and strategic defense strategy, countering weapons of mass destruction, global strategic affairs, defense capabilities continuity, countering coercion and subversion, homeland defense support of civil authorities, planning, technological and other external effects on strategic requirements, space and cyber strategic guidance planning, protection of defense critical infrastructure, contingency and stability operations, nuclear planning, and strategic-level simulations of areas of interest for legislative and executive branch decision-makers.<br><br>Technical Support for the USD(Personnel & Readiness):<br>Studies and analyses in the following areas:<br><br>Rebuilding readiness, sustainment and planning for the force of the future such as active and reserve recruiting and retention issues, training requirements, maintaining strategic force depth, compensation and quality of life matters and retention, identifying critical personnel requirements, reserve component readiness and sustainability, health and medical issues, crisis and contingency readiness, diversity management and equal opportunity, and strategies for managing the Total Force portfolio.<br><br>***FY 2021 Plans:***<br>No funding is requested for this program element in FY 2021.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The budget reflects realignment of budget authority to other programs for studies and analyses within the Office of the Under Secretary of Defense for FY 2021 and beyond as a result of defense-wide review initiatives. | | | |
| **Accomplishments/Planned Programs Subtotals** | 21.281 | 18.079 | 0.000 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0605104D8Z / *Technical Studies Support and Analysis* | **Project (Number/Name)**<br>421 / *Technical Studies* |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support* | **R-1 Program Element (Number/Name)**<br>PE 0605128D8Z / *Classified Program* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 770.709 | 103.000 | 104.000 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| 128: *Classified Program* | 770.709 | 103.000 | 104.000 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**Note**

N/A

**A. Mission Description and Budget Item Justification**

Classified

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 0.000 | 0.000 | 0.000 | - | 0.000 |
| Current President's Budget | 103.000 | 104.000 | 0.000 | - | 0.000 |
| Total Adjustments | 103.000 | 104.000 | 0.000 | - | 0.000 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | 103.000 | 104.000 | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | - | - | | | |

| Congressional Add Details ($ in Millions, and Includes General Reductions) | FY 2019 | FY 2020 |
|---|---|---|
| **Project:** 128: *Classified Program* | | |
| Congressional Add: *Classified* | 103.000 | 104.000 |
| Congressional Add Subtotals for Project: 128 | 103.000 | 104.000 |
| Congressional Add Totals for all Projects | 103.000 | 104.000 |

**Change Summary Explanation**

N/A

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support* | **R-1 Program Element (Number/Name)**<br>PE 0605128D8Z / *Classified Program* |

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 |
|---|---|---|
| ***Congressional Add:*** Classified | 103.000 | 104.000 |
| ***FY 2019 Accomplishments:*** Classified | | |
| ***FY 2020 Plans:*** Classified | | |
| **Congressional Adds Subtotals** | 103.000 | 104.000 |

**D. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

N/A

**E. Acquisition Strategy**

N/A

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support* | **R-1 Program Element (Number/Name)**<br>PE 0605142D8Z / *Systems Engineering* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 255.022 | 37.446 | 37.140 | 49.376 | - | 49.376 | 42.699 | 43.415 | 44.409 | 45.071 | Continuing | Continuing |
| 142: *Systems Engineering* | 225.815 | 29.460 | 35.140 | 42.976 | - | 42.976 | 36.282 | 37.001 | 37.889 | 38.479 | Continuing | Continuing |
| 143: *Program Protection* | 29.207 | 5.986 | 0.000 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| 842: *Mission Engineering* | 0.000 | 2.000 | 2.000 | 4.400 | - | 4.400 | 4.409 | 4.406 | 4.415 | 4.456 | Continuing | Continuing |
| 078: *Integration Technology and Tools* | - | 0.000 | 0.000 | 2.000 | - | 2.000 | 2.008 | 2.008 | 2.105 | 2.136 | Continuing | Continuing |

**Note**

Beginning in FY 2021, DoD Modeling and Simulation Management Office (MSMO) funding, Engineering Resilient Systems (ERS), and Systems Engineering Research Center (SERC) activities aligned with the national defense modernization priorities and transitioned from Engineering Science and Technology (PE 0603833D8Z) to Systems Engineering (PE 0605142D8Z). Additionally, the Test & Evaluation Policy Workforce is transferred from Development Test & Evaluation (PE 0605804D8Z) to Systems Engineering (PE 0605142D8Z).

**A. Mission Description and Budget Item Justification**

This Program Element (PE) establishes the dedicated funding line to carry out the mission integration and systems engineering duties as described in Deputy Secretary of Defense Memorandum, "Establishment of the Office of the Under Secretary of Defense for Research and Engineering and the Office of the Under Secretary of Defense for Acquisition and Sustainment," July 13, 2018.

In alignment with the National Defense Strategy (NDS), the Systems Engineering (SE) PE supports a more lethal force by analyzing near-, mid-, and long-term approaches to realizing mission capability, assessing that capability against anticipated adversaries in relevant operational environments, and determining revised system, architectural, tech surprise opportunities to maintain tactical edge, insert technology, improve interoperability and formulate long-term strategies to retain or improve our capabilities against our adversaries. Deputy Director, Engineering (DD, Eng) oversees, initiates, and recommends opportunities to align technology investments to accelerate capability delivery, or modifying existing systems. This program supports:

(1) Reforming the Department for greater performance and affordability by maintaining visibility into major programs and conducting independent technical risk assessments (ITRAs) to advise the Under Secretary of Defense for Research and Engineering (USD(R&E)) and Milestone Decision Authorities on progress towards achieving key performance parameters, technology maturation, interoperability, and cyber security posture;
(2) Modernizing key capabilities and mission priorities through technical support for mission engineering and establishing budget priorities; and
(3) Cultivates workforce talent by both developing engineering methods, policies, processes, and tools that are cross cutting technologies and integrating technical disciplines to advance DoD engineering practices and providing advocacy and oversight for the Department's engineering workforce to build a capable, current, and innovative engineering workforce.

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support* | **R-1 Program Element (Number/Name)**<br>PE 0605142D8Z / *Systems Engineering* |

In FY 2019, this PE began activities to carry out responsibilities described in the FY 2017 National Defense Authorization Act (NDAA) Section 855 titled Mission Integration Management (MIM).

In FY 2020, funding from Project Code 143, Program Protection, was re-aligned to a new Maintaining Technology Advantage Program Element (PE) 0605797D8Z, to support efforts which have transitioned to the Deputy Director, Strategic Technology Protection and Exploitation (STP&E).

Beginning in FY 2021, DoD Modeling and Simulation Management Office (MSMO) funding, Engineering Resilient Systems (ERS), and Systems Engineering Research Center (SERC) activities aligned with the national defense modernization priorities and transitioned from Engineering Science and Technology (PE 0603833D8Z) to Systems Engineering (PE 0605142D8Z). Additionally, the Test & Evaluation Policy Workforce is transferred from Development Test & Evaluation (PE 0605804D8Z) to Systems Engineering (PE 0605142D8Z).

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 38.784 | 37.140 | 41.606 | - | 41.606 |
| Current President's Budget | 37.446 | 37.140 | 49.376 | - | 49.376 |
| Total Adjustments | -1.338 | 0.000 | 7.770 | - | 7.770 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | -1.331 | - | | | |
| • Transfer of Test & Evaluation Policy Workforce | - | - | 1.850 | - | 1.850 |
| • Funding realignment for enhanced engineering expertise | - | - | 11.531 | - | 11.531 |
| • Reduction for Defense Wide Review | - | - | -7.550 | - | -7.550 |
| • Other Adjustments | -0.007 | - | -0.054 | - | -0.054 |
| • Sustain Research and Technology Advancements | - | - | 1.993 | - | 1.993 |

**Change Summary Explanation**

The FY 2021 base increase of $7.770 million is the net sum of: a transfer of Test & Evaluation Policy Workforce ($1.850 million) from Development Test & Evaluation (PE 0605804D8Z) to support proper alignment/execution; a resource realignment of $11.531 million from Engineering Science & Technology (Program Element 0603833D8Z) to support enhanced engineering expertise and assessments for priority mission oriented modernization prototypes; a $1.993 million

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support* | **R-1 Program Element (Number/Name)**<br>PE 0605142D8Z / *Systems Engineering* |

funding increase to enhance Integration, Technology and Tools; a $0.054 million reduction for economic assumptions; and a $7.550 million reduction where funds are realigned to higher priority DoD missions resulting from Defense Wide Review.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 6 | R-1 Program Element (Number/Name)<br>PE 0605142D8Z / *Systems Engineering* | Project (Number/Name)<br>142 / *Systems Engineering* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 142: *Systems Engineering* | 225.815 | 29.460 | 35.140 | 42.976 | - | 42.976 | 36.282 | 37.001 | 37.889 | 38.479 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

Project P142 activities include the following functions:

• Support acceleration of USD(R&E)'s modernization initiatives and Assistant Directors' Science and Technology (S&T) roadmap investments; support mission based prototype projects to guide resource investments.

• Develop government reference architectures; establish enduring mission engineering analytic capability.

• Review the systems engineering plans (SEPs) and activities for major defense acquisition programs (MDAPs) under OSD purview and alternate pathway programs to ensure they are adequate to support fielding and the achievement of cost, schedule and performance goals to include readiness, i.e. producibility, reliability, maintainability, sustainment, and other considerations.

• Conceive plans and lead independent technical risk assessments and command directed technical assessments of MDAP under OSD purview and alternate pathway programs to shape technical planning and management to ensure program success.

• Provide risk assessments to support the development of cost, schedule, and performance targets required by U.S.C. 10 Sec 2448a.

• Conduct other technical reviews as requested, such as Nunn-McCurdy certification reviews, Non-Advocate Reviews, focused technical assessments, and software readiness reviews to identify and mitigate program risk.

• Participate in mission engineering activities by providing functional and program specific engineering expertise to support joint mission level analysis.

• Develop and establish DoD-level policy, guidance, and workforce development efforts ensuring systems engineering rigor in acquisition to drive the development of fully capable and supportable weapons systems.

• Oversee Service and other Component organizations implementation of engineering initiatives and approve or conduct independent assessments. Advance the principles of interoperability, integration, modularity, and open systems to improve requirements, architecture, design, development and overall acquisition and sustainment of weapon systems.

• Develop education and training materials for instructing, maintaining, and enhancing the defense acquisition workforce. Activities include: (1) developing guidance to enhance Engineering (ENG), Production Quality and Manufacturing (PQM) and Test and Evaluation (T&E) acquisition career planning and progression; and (2) monitoring, and facilitating Defense Acquisition University (DAU) updates to the systems engineering, quality and specialty engineering courses, to ensure the curriculum represents the education and training requirements necessary to be a viable team member in the acquisition process.

• Improve the DoD's capabilities in specialty engineering and software engineering through policy, program oversight, fostering practice and technology improvements, initiating long-term strategic improvements, and collaborating with industry.

• Advance DoD engineering practices through the development and use of methods, processes, and tools, such as digital engineering, modeling and simulation, and model-based systems engineering, for engineering on weapon systems.

• Serve as the Defense Standardization Executive and oversee the Defense Standardization Program.

• Guide Service and other component organizations in the development planning process to ensure proposed MDAP programs are executable within acceptable levels of risk.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0605142D8Z / *Systems Engineering* | **Project (Number/Name)**<br>142 / *Systems Engineering* |

• Resolve long-term major systems engineering challenges such as systems of systems (SoS) systems engineering, systems engineering of complex systems, and pre-program formulation systems engineering tradeoff analysis.
• Integrates high fidelity, physics-based modeling with advanced analytic tools to enable rapid design and analysis of current and future weapon systems.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Systems Engineering | 29.460 | 35.140 | 42.976 |
| ***Description:*** The DD, Engineering provides objective assessments of program risk to support knowledge-based decision making by DoD leaders regarding DoD weapon systems.<br><br>***FY 2020 Plans:***<br>Strategic Thrust: Program Support<br>• Monitor programs, providing SE oversight and support to acquisition and special interest programs<br>• Enhance implementation of Independent Technical Risk Assessments (ITRAs) through increased technical analysis, improved access to technical subject matter experts and collaboration with the Services<br>• Expand engineering support to include alternate acquisition pathways, e.g. Middle-Tier of Acquisition and Software Intensive Acquisition programs<br>• Expand use of detailed performance measurement and analysis<br>• Provide decision-quality information and recommendations to Defense Acquisition Boards (DAB), In Progress Reviews, Peer Reviews, and PDR (Preliminary Design Review)/Critical Design Review (CDR) assessments<br><br>Strategic Thrust: Workforce Development<br>• Carry out duties as Functional Lead for Engineering (ENG), Production, Quality, and Manufacturing (PQM), Test and Evaluation (T&E), and all Department non-construction engineering and quality assurance<br>• Build an enduring high performance engineering culture across the Department<br>• Update and deploy courses with increased technical rigor and complex, case-based exercises<br>• Pursue workforce development initiatives including leadership development, specialized training, and improved instructional methods<br>• Assess engineering workforce capability and capacity, and, working with Services and other Component organizations, develop strategies to address identified gaps<br><br>Strategic Thrust: Engineering Policy and Guidance<br>• Develop and update core SE and T&E policy, guidance, and standards; review all acquisition policy for SE and T&E implications<br>• Develop engineering and T&E guidance and policies for the acquisition process including, but not limited to, software modeling and simulation; configuration management; data management; and risk management<br>• Assess challenges and impact; develop new guidance, best practices, methods, processes and tools to more effectively implement SE for Systems of Systems (SoS) | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
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| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0605142D8Z / *Systems Engineering* | **Project (Number/Name)**<br>142 / *Systems Engineering* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| • Provide guidance to Defense acquisition programs for developing and documenting each program's technical strategy and management approach in the Systems Engineering Plan (SEP) and Test and Evaluation Master Plan (TEMP) throughout the program's lifecycle<br><br>Strategic Thrust: Specialty Engineering<br>• Develop engineering guidance and policies for the integration of specialty engineering functions as part of the SE responsibility in the acquisition process<br>• Conduct studies and analyses to identify challenges and opportunities to develop and promulgate best practices and guidance for applying specialty engineering principles, concepts, and practices in defense acquisition programs<br>• Conduct activities to develop and implement plans to enhance the specialty engineering workforce<br><br>Strategic Thrust: Early Systems Engineering and Development Planning<br>• Expand USD(R&E) participation in the Joint Capabilities Integration and Development System to enhance capability and systems requirements development though systems / missions engineering insights<br>• Perform early acquisition risk assessment including pre-Milestone A (pre-MS A) engagement with Joint Requirements Oversight Council processes<br>• Support: (1) Services and Combatant Commands (CCMD's) in pre-MS A formulation; (2) requirements analyses and analysis of alternatives; and (3) initial capabilities document definition and development<br><br>Strategic Thrust: Engineering Tools and Environments<br>• Support implementation of digital engineering principles, concepts, and practices into the activities of the DoD related to all aspects of weapon system lifecycle and use<br>• Establish guidance and education to support digital engineering use in systems engineering<br>• Continue identifying gaps in digital engineering methods, processes, tools to inform research and development.<br>• Develop comprehensive guidance for development and use of modular and open architectures to support integration of emerging technologies | | | |
| ***FY 2021 Plans:***<br>Strategic Thrust: Program Support/Technical Risk Assessments<br>• Enhance independent technical risk assessments<br>• Provide risk assessments to support cost, schedule, and performance targets required by U.S.C. 10 Sec 2448a<br>• Expand engineering support to Missile Defense Agency programs<br>• Increase support to Software Acquisition programs<br>• Support acceleration of USD(R&E)'s modernization initiatives in accordance with the National Defense Strategy<br>• Provide engineers and technical leaders to develop and integrate technologies and modernization priorities | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
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| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0605142D8Z / *Systems Engineering* | **Project (Number/Name)**<br>142 / *Systems Engineering* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| • Continued support to acquisition program managers in developing and documenting viable technical management approach<br>• Conduct technical reviews of acquisition to confirm program execution in accordance with systems engineering plans<br><br>Strategic Thrust: Workforce Development<br>• Carry out duties as Functional Lead for Engineering (ENG), Production, Quality, and Manufacturing (PQM), Test and Evaluation (T&E), and all Department non-construction engineering and quality assurance<br>• Build an enduring high performance engineering culture across the Department<br>• Update and deploy courses with increased technical rigor and complex, case-based exercises<br>• Pursue workforce development initiatives including leadership development, specialized training, and improved instructional methods<br>• Assess engineering workforce capability and capacity, and, working with Services and other components organizations, develop strategies to address identified gaps<br><br>Strategic Thrust: Engineering Policy and Guidance<br>• Develop and update core SE and T&E policy, guidance and standards; review all acquisition policy for SE and T&E implications<br>• Develop engineering and T&E guidance and policies for the acquisition process including, requirements for use in alternate acquisition pathways<br>• Assess challenges and impact; develop new guidance, best practices, methods, processes and tools to more effectively implement SE for product lines and system of systems (SoS)<br>• Provide guidance to Defense acquisition programs for developing and documenting each program's technical strategy and management approach in the SEP and TEMP throughout the program's lifecycle<br><br>Strategic Thrust: Specialty Engineering<br>• Develop engineering guidance and policies for the integration of specialty engineering functions as part of the SE responsibility in the acquisition process not limited to manufacturing engineering; reliability and maintainability engineering; human systems integration; and value engineering<br>• Conduct studies and analyses to identify challenges and opportunities to develop and promulgate best practices and guidance for applying software engineering principles, concepts, and practices in defense acquisition programs<br>• Conduct activities to develop and implement plans to enhance the specialty engineering workforce<br><br>Strategic Thrust: Early Systems Engineering and Development Planning<br>• Expand USD(R&E) participation in the Joint Capabilities Integration and Development System to enhance capability and systems requirements development though systems / missions engineering insights<br>• Perform early acquisition risk assessment including pre-MS A engagement with Joint Requirements Oversight Council processes | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0605142D8Z / *Systems Engineering* | **Project (Number/Name)**<br>142 / *Systems Engineering* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| • Support: (1) Services and COCOMs in pre-MS A formulation; (2) requirements analyses and analysis of alternatives; and (3) initial capabilities document definition and development<br><br>Strategic Thrust: Engineering Tools and Environments<br>• Develop and sustain digital engineering and modular open systems approaches (MOSA) across the Department through policy, guidance, standards, and major program support<br>• Develop and apply a digital engineering concept of operations, to include using model-based processes, products, training, data/model management to support analysis of prototype development efforts, ease integration of emerging technologies and gauge impacts on overall mission performance<br>• Develop and use a common semantic framework to enable modular open architectures and cross-domain tool interoperability, compatibility and reuse<br>• Promote use of decision support environments and high-fidelity simulations for trade space analysis and development of resilient designs<br><br>Strategic Thrust: Systems Architectures<br>• System Technical Architecture Foundations. Develop product line reference architectures, including methods for governing changes and managing technical data. Develop and conduct training in use of reference architectures.<br>• Perform architecture assessments to verify compliance of major systems interfaces through use of standards. Provide recommendations to improve compliance.<br>• Analysis. Perform architecture tradeoff analyses to enable effective mission engineering and manage integration of emerging technologies with systems in development, and in operation.<br>• Inter-System of Systems Architecture Analysis: develop policy and guidance on system architecture verification, interoperability analysis, architecture development plans, and system of system (SoS)-level capability gaps<br>• Implement a taxonomy and ontology establishing the basis for process and application data standardization and usability<br><br>Strategic Thrust: Modeling and Simulation (M&S)<br>• Enhance the Defense M&S Reference Architecture with additional patterns identified through user feedback.<br>• Develop M&S framework and conduct M&S analyses to support Mission Engineering<br>• Work with USSOCOM and Simulator Interoperability Senior Steering Group to execute implementation of the OUSD(R&E)-signed Decision Memorandum.<br>• Represent U.S. interests in International M&S activities as required.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Level of effort increases by $7.843 million from FY 2020 and FY 2021. These changes reflect a net of a transfer of Test & Evaluation Policy Workforce from Development Test & Evaluation (PE 0605804D8Z), a resource realignment from Engineering | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0605142D8Z / *Systems Engineering* | **Project (Number/Name)**<br>142 / *Systems Engineering* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Science & Technology (PE 0603833D8Z) and a reduction for DoD priorities and economic assumption adjustments. Overall, the level of effort is a significant increase in investment in program support, to include an increase in the quality of technical risk assessments, as well as establishing reference architectures to enable transition of emerging technologies into acquisition programs and systems currently in operation. | | | |
| **Accomplishments/Planned Programs Subtotals** | 29.460 | 35.140 | 42.976 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 6 | R-1 Program Element (Number/Name)<br>PE 0605142D8Z / *Systems Engineering* | Project (Number/Name)<br>143 / *Program Protection* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 143: *Program Protection* | 29.207 | 5.986 | 0.000 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

This program element (PE) supports the program protection activities of the Deputy Director, Strategic Technology Protection and Exploitation (DD, STP&E). The Department of Defense (DoD) must address cybersecurity and supply chain risks to DoD networks, weapons systems, and information stored and processed on both DoD and Defense Industrial Base (DIB) unclassified contractor information networks that support DoD programs. Increased reliance on the internet as a vehicle for sharing information, globalization of the supply chain, and advanced persistent threats (APTs) that can evade commercially available security tools and defeat generic security best practices, drives the need for diligent program protection planning and execution. Program Protection Planning (PPP) includes protection of classified and unclassified controlled technical information, critical program information, critical components, and critical mission functions, and integrates high-level security policies and practical expertise to specific acquisition and S&T practices, systems engineering activities, and risk reduction activities. Through this initiative the Department is maturing system security engineering methodologies to protect controlled unclassified information, to include controlled technical information on contractor information networks; improve mitigation and management of supply chain risk management risks, improve integration of cybersecurity into the engineering processes, improve software assurance practices, mature processes to identify and protect Critical Program Information and improve program protection planning. Activities carried out, support implementation of DoD Instruction 5200.44 Trusted Systems and Networks with the use of proven mitigation techniques and tools, the ongoing refinement of risk management processes, and creation of needed technology; implementation of DoD Instruction 5200.39 Critical Program Information (CPI) Identification and Protection Within Research, Development, Test, and Evaluation (RDT&E) to identify and protect Critical Program Information; and implementation of DoD Instruction 8582.01 Security of Unclassified DoD Information on Non-DoD Information Systems for Safeguarding Controlled Unclassified Information on contractor owned networks.

DD, STP&E provides independent assessments of research, technology and defense acquisition program's system security engineering and program protection implementation.

The DD, STP&E reviews and approves the PPP for each Major Defense Acquisition Program, and monitors and reviews the system security engineering planning activities of MDAPs and other defense acquisition programs, as directed by the Secretary of Defense.

This PE includes efforts by the office of the DD, STP&E in implementing the Department's Trusted Defense System Strategy. Specifically, the PE will develop and mature the critical sub discipline of systems engineering - system security engineering (SSE), Hardware and Software Assurance, and the Comprehensive Program Protection Planning process that implements a risk-based approach to protection of critical program information, critical components and mission functions, and information in acquisition programs. These efforts include study and maturation of policy, guidance, system security discipline fundamentals, such as engineering methods, tools, and best practices, and establishing a coalition of assurance activities across the DoD to provide analytical and technical support to acquisition programs. These activities will be promulgated in defense acquisition as a fundamental element of the DD, STP&E systems engineering and technical reviews.

In FY 2020, funding from this project will transfer to the Maintaining Technology Advantage PE 0605797D8Z, in alignment with the DD, STP&E mission.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0605142D8Z / *Systems Engineering* | **Project (Number/Name)**<br>143 / *Program Protection* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Program Protection | 5.986 | - | - |
| ***Description:*** The project provides system security engineering policy, guidance, and objective assessments to reduce risks in sharing and storing Controlled Technical Information, improve mitigation of supply chain risk management risks, improve integration of cybersecurity into the engineering processes, integrate defense exportability and anti-tamper practices, mature processes to identify Critical Program Information and improve program protection planning. Activities carried out support implementation of DoD Instruction 5200.44 Trusted Systems and Networks with the use of proven mitigation techniques and tools, the ongoing refinement of risk management processes; implementation of DoD Instruction 5200.39 Critical Program Information (CPI) Identification and Protection Within Research, Development, Test, and Evaluation (RDT&E) to identify and protect Critical Program Information; and implementation of DoD Instruction 8582.01 Security of Unclassified DoD Information on Non-DoD Information Systems for Safeguarding Controlled Unclassified Information on contractor owned networks. | | | |
| **Accomplishments/Planned Programs Subtotals** | 5.986 | - | - |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 6 | R-1 Program Element (Number/Name)<br>PE 0605142D8Z / *Systems Engineering* | Project (Number/Name)<br>842 / *Mission Engineering* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 842: *Mission Engineering* | 0.000 | 2.000 | 2.000 | 4.400 | - | 4.400 | 4.409 | 4.406 | 4.415 | 4.456 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

This Program Element (PE) establishes a dedicated funding line to support activities to carry out responsibilities described in FY 2017 National Defense Authorization Act (NDAA) Section 855 titled Mission Integration Management (MIM).

The Mission Engineering (ME) PE supports the National Defense Strategy goals of developing a more lethal force by instituting an enterprise level mission engineering approach to analyzing near-, mid-, and long-term gaps and solutions. The enterprise necessarily includes the Services, the Combatant Commands, and the Joint Staff. The activities conducted through this PE will provide engineering analysis at the mission, campaign, and engagement levels to support the prioritization of the Department's modernization initiatives. This systematic enterprise approach will support the realization of mission capability by assessing the joint mission gaps and capability solutions against anticipated adversaries in relevant operational environments. Mission engineering will support development of an analytically sound set of decisions resulting in a more rigorous technical assessment against technical priorities. The PE will support establishment of multiple mission architectures and further support and align investment opportunities in order to take advantage of tech surprise opportunities, maintain a tactical edge, insert technology, improve interoperability and formulate long-term strategies to retain or improve our capabilities against our adversaries. Deputy Director, Engineering (DD, Eng) oversees, initiates, or recommends opportunities to align technology investments to accelerate capability delivery, or modifying existing systems.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Mission Engineering | 2.000 | 2.000 | 4.400 |
| ***FY 2020 Plans:***<br>• Coordinate with Joint Service and Commanders of the Combatant Commands to identify major threats, mission scope, Concept of Operations (CONOPS) development, and Operation Plans (OPLAN).<br>• Initiate translation of multi-Service and Coalition mission-based needs for the requirements process, resulting in Capability Requirements.<br>• Develop strategy to use relevant cross-Service mission threads in coordination with Joint Staff to identify capability gaps.<br>• Determine where multi-Service and Coalition mission areas would benefit from mission engineering and a coordinated implementation approach to set an operational context.<br>• Prioritize and/or provide resources for initial Joint mission engineering analysis.<br>• Conduct mission characterization activities for selected Joint missions.<br>- Develop mission based inputs and options for concepts, requirements, prototypes, resources, mission design, and operationally relevant test environment. Includes identification of data needs to assess capability performance, i.e., gain an understanding of objectives, key users, user roles and expectations, and constituent system capabilities.<br>- Review available performance and test data for the selected Joint mission area(s). | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
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| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0605142D8Z / *Systems Engineering* | **Project (Number/Name)**<br>842 / *Mission Engineering* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| • Define mission architecture framework and develop initial artifacts.<br>• Provide decision support to prioritize investments.<br>• Establish and apply mission engineering analysis tools and infrastructure.<br>***FY 2021 Plans:***<br>• Continue to establish enduring mission engineering analytic capability and increased capacity<br>• Perform high-level executable system of system architecture trades and analyses for product line and technology to address mission capability gaps<br>• Develop architecture framework that synthesizes artifacts across the Department including metrics, resource estimates and program impacts<br>• Continue development of government reference mission architectures<br>• Expand mission engineering support to additional high priority mission sets and joint mission based prototyping projects.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Level of effort increases by $2.400 milion from FY 2020 to FY 2021. These changes reflect an increase in investment in mission engineering to include addition of tools and an increase in capability to conduct mission level assessments. | | | |
| **Accomplishments/Planned Programs Subtotals** | 2.000 | 2.000 | 4.400 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 6 | R-1 Program Element (Number/Name)<br>PE 0605142D8Z / *Systems Engineering* | Project (Number/Name)<br>078 / *Integration Technology and Tools* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 078: *Integration Technology and Tools* | - | 0.000 | 0.000 | 2.000 | - | 2.000 | 2.008 | 2.008 | 2.105 | 2.136 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

Project P142 supports the National Defense Strategy goals of developing a more lethal force by instituting an enterprise-wide research, methods, practices and tools to: integrate technology innovations to improve the systems engineering practices; develop systems engineering architecting techniques and formats, supporting modular, rapid fielding of mature warfighting capabilities; and use common, reusable hardware and software components that can be more readily adapted and refreshed, allowing DoD to deploy and support the latest technologies. The project also sustains the ability to identify and/or create innovative methods and tools in systems engineering practice to improve the Department's ability to develop and deploy complex weapon systems.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Integration Technology and Tools | 0.000 | - | 2.000 |
| ***FY 2021 Plans:***<br>Strategic Thrust: Integration, Technology and Tools<br>• Develop comprehensive engineering methods for development and use of modular and open architectures to support integration of emerging technologies<br>• Establish MOSA Technical Evaluation that assesses an acquisition technical approach for modular design practices included in (1) technical plan, (2) architecture, and (3) design to develop a technical solution with a modular open system approach.<br>• Develop and apply a digital engineering concept of operations, to include using model-based processes, products, training, data/ model management to support analysis of prototype development efforts, ease integration of emerging technologies and gauge impacts on overall mission performance<br>• Provide Methods, Processes, and Tools to Manage MOSA Business Practices for Intellectual Property and Tech Data Management; provide the ability for competition of replacement elements, when properly supported by appropriate data rights/ intellectual property access<br>• Develop and use engineering tools/models: Architectures, Digital Engineering, Software, and Specialty Engineering (e.g. R&M, Manufacturing, HSI, System Safety)<br>• Provide flexible, user-configurable tools and experienced analytical capability to enable cross system, system of system and family of system analysis of component systems, capabilities, and organizations<br>• Develop Knowledge Management systems to provide methods and systematic approaches for information and knowledge flow to and between the stakeholders at the right time for the right use<br>• Sponsor and oversee research on and development of (including tests and demonstrations) automated tools for composing systems of systems on demand (FY17 NDAA Sec 855) | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0605142D8Z / *Systems Engineering* | **Project (Number/Name)**<br>078 / *Integration Technology and Tools* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Strategic Thrust: Systems Engineering Research Center (SERC)<br>• Complete SERC funded projects started in prior fiscal years; work with the Services to identify which ongoing projects they may wish to maintain, conclude or initiate with Service funding; and establish a business model to sustain SERC's network of universities. The SERC efforts directly aligns USD(R&E) efforts to the Department's modernization priorities.<br>• Sustain capabilities that support innovation and the use of critical technology for emergent and evolving mission objectives<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The increase in the funding profile reflects the realignment of the SERC effort from Engineering Science and Technology (0603833D8Z) in FY 2021. | | | |
| **Accomplishments/Planned Programs Subtotals** | 0.000 | - | 2.000 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support* | **R-1 Program Element (Number/Name)**<br>PE 0605151D8Z / *Studies and Analysis Support – OSD* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 24.752 | 3.423 | 4.759 | 5.777 | - | 5.777 | 5.163 | 5.259 | 5.871 | 6.104 | Continuing | Continuing |
| 151: *Studies and Analysis Support – OSD* | 24.752 | 3.423 | 4.759 | 5.777 | - | 5.777 | 5.163 | 5.259 | 5.871 | 6.104 | Continuing | Continuing |

**Note**

Defense-Wide Reviews (DWR) - Funding for Studies and Analysis Support - OSD for FY2021 was reduced by $958 thousand resulting from the DWR which focused on the Secretary's guidance to streamline operations, increase efficiency, and promote greater affordability within the OSD and Defense Agencies and Field Activities in order to ensure the Department's optimum alignment to the National Defense Strategy and DoD strategic guidance, with particular focus on building a more lethal, resilient, agile, and ready force while strengthening alliances, prioritizing cyber and space capabilities, and focusing on innovation to maintain the technological advantage. The FY2021 reduction is offset by an administrative zero-sum transfer of $2.226 million from A&S.

**A. Mission Description and Budget Item Justification**

The Studies and Analysis Support – OUSD (P&R) serves to leverage specialized expertise and critical capabilities designed to help meet varied research, study, and analytical support needs in the manpower, personnel, human capital, force readiness, training, education, resiliency, and health services portfolio. This funding supports intellectually rigorous, relevant and timely assessment of policies, programs, and procedures across the personnel and readiness enterprise. Funded research, studies, program evaluations, surveys, and analysis support P&R roles in executing the National Defense Strategy in a proactive and forward leaning posture, focusing on a strategic programmatic and policy framework for the future.

This funding is leveraged to addresses key, strategic, and long-term challenges facing the Department, and include targeted assessments to support program evaluation and efficacy; comprehensive research and complex exploration to support data driven decision-making; and critical analysis to develop needed evidentiary bases for policy development or modification.

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support* | **R-1 Program Element (Number/Name)**<br>PE 0605151D8Z / *Studies and Analysis Support – OSD* |

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 3.534 | 4.759 | 4.509 | - | 4.509 |
| Current President's Budget | 3.423 | 4.759 | 5.777 | - | 5.777 |
| Total Adjustments | -0.111 | 0.000 | 1.268 | - | 1.268 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | -0.001 | - | | | |
| • SBIR/STTR Transfer | -0.110 | - | | | |
| • OSD - USD A&S Reductions | - | - | 2.226 | - | 2.226 |
| • Defense-Wide Review | - | - | -0.958 | - | -0.958 |

**Change Summary Explanation**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 6 | R-1 Program Element (Number/Name)<br>PE 0605151D8Z / *Studies and Analysis Support – OSD* | Project (Number/Name)<br>151 / *Studies and Analysis Support – OSD* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 151: *Studies and Analysis Support – OSD* | 24.752 | 3.423 | 4.759 | 5.777 | - | 5.777 | 5.163 | 5.259 | 5.871 | 6.104 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

The Studies and Analysis Support – OUSD (P&R) serves to leverage specialized expertise and critical capabilities designed to help meet varied research, study, and analytical support needs in the manpower, personnel, human capital, force readiness, training, education, resiliency, and health services portfolio. . This funding supports intellectually rigorous, relevant and timely assessment of policies, programs, and procedures across the personnel and readiness enterprise. Funded research, studies, program evaluations, surveys, and analysis support P&R roles in executing the National Defense Strategy in a proactive and forward leaning posture, focusing on a strategic programmatic and policy framework for the future.

This funding is leveraged to addresses key, strategic, and long-term challenges facing the Department, and include targeted assessments to support program evaluation and efficacy; comprehensive research and complex exploration to support data driven decision-making; and critical analysis to develop needed evidentiary bases for policy development or modification.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** 151 Studies and Analysis Support – OSD | 3.423 | 4.759 | 5.777 |
| ***Description:*** The Studies and Analysis Support - OUSD (P&R) funds research, program evaluations, surveys and analysis. It conducts comprehensive, independent, interdisciplinary, intellectually rigorous, relevant and timely research and analysis of policy challenges associated with the sustainment (recruitment, retention, training, education, readiness, lethality, health, and resiliency) of the Total Force necessary to execute and support the National Defense Strategy. | | | |
| ***FY 2020 Plans:***<br>• Conduct comprehensive, independent, interdisciplinary, intellectually rigorous, relevant and timely research and analysis of policy challenges associated with the sustainment (recruitment, retention, training, education, readiness, lethality, health, and resiliency) of the Total Force necessary to execute and support the National Defense Strategy. | | | |
| ***FY 2021 Plans:***<br>Conduct research, analysis and complex exploration of policy challenges within the recruitment, retention, training, education, readiness, lethality, health, and resiliency of the Total Force to meet human capital development actions in support of the National Defense Strategy.<br><br>• Assessing national trends with respect to the population | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0605151D8Z / *Studies and Analysis Support – OSD* | **Project (Number/Name)**<br>151 / *Studies and Analysis Support – OSD* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| • Conducting assessments of workplace climates and program strategies<br>• Understanding best practices for employee engagement/relevancy<br>• Addressing force structure, capability and readiness in evolving warfighter domains<br>• Understanding the future of dependent care in the DoD; modernizing our training infrastructure for the future fight<br>• Adapting the recruiting/retention environment for the modern force<br>• Challenging cultural norms of force mix<br>• Adapting DoD mindset for societal/economic population changes<br>• Understanding future force requirements for urbanization and population shifts<br>• Understanding technological impacts on health care delivery.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The FY 2021 funding request was reduced by $958 thousand during the Defense Wide Review to account for contract savings resulting in less funds needed. OUSD(P&R) has taken significant steps to improve governance of our studies program, increasing senior leader accountability and ensuring more robust return on investment. Funding decrease represents continue refinement in program processes, added rigor and accountability for studies, and increased diversity in and competition of research approaches and methodologies. | | | |
| **Accomplishments/Planned Programs Subtotals** | 3.423 | 4.759 | 5.777 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support* | **R-1 Program Element (Number/Name)**<br>PE 0605161D8Z / *Nuclear Matters* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 32.441 | 4.854 | 8.307 | 16.552 | - | 16.552 | 16.901 | 17.277 | 17.617 | 17.816 | Continuing | Continuing |
| 161: *Nuclear Matters* | 32.441 | 4.854 | 8.307 | 16.552 | - | 16.552 | 16.901 | 17.277 | 17.617 | 17.816 | Continuing | Continuing |

**Note**

FYDP funding increases are addressing the need for technical experts to assist with the Nuclear Deterrent Enterprise Review Group and nuclear deterrent modeling and analysis to help make data-driven decisions for nuclear modernization efforts.

**A. Mission Description and Budget Item Justification**

The mission of Nuclear Matters is to ensure the continued credibility, effectiveness, safety, and security of the U.S. deterrent in order to deter nuclear and non-nuclear attack; assure U.S. allies and partners; achieve U.S. objectives if deterrence fails; and hedge against an uncertain future. Nuclear Matters serves as the DoD focal point for the modernization and sustainment of the U.S. nuclear weapons stockpile, as well as for a wide range of nuclear counter-terrorism and counter-proliferation issues.

The funds for this program are used to support research, development, test and evaluation efforts as well as studies and analyses for nuclear weapons modernization, sustainment; security; use control; nuclear weapons stockpile safety; and survivability requirements. Funds are also used to develop and implement plans for stockpile transformation; infrastructure analyses and assessments; DoD-National Nuclear Security Administration (NNSA) Nuclear Weapons Council (NWC) activities, as mandated by Title 10 USC, section 179; radiological and nuclear emergency response efforts; and management of international programs of nuclear cooperation, particularly with respect to enhancing international nuclear safety and security. Nuclear Matters is also responsible for policy development and implementation for personnel reliability; nuclear weapons, nuclear command and control, and special nuclear materials security; use control; nuclear weapons transportation; physical security equipment; countering nuclear threats; and nuclear and radiological incident response. Additionally, Nuclear Matters serves as the focal point for DoD activities and initiatives related to the dual missions of sustaining a safe, secure, and effective nuclear deterrent and countering the threat from nuclear terrorism and nuclear proliferation.

Nuclear Matters is leading a Tri-Lab effort (Los Alamos National Laboratory, Lawrence Livermore National Laboratory, and Sandia National Laboratories) to provide data-driven, mission engineering support to integrated portfolio management for 21st Century nuclear deterrent sustainment and modernization. The United States is modernizing all three legs of its nuclear triad and is also reconstituting its nuclear weapons production capability at roughly the same time, while simultaneously sustaining weapons and systems that have aged well beyond their original design lives. The Nuclear Weapons Council and the Nuclear Deterrent Enterprise Review Group need to manage the transition from legacy Cold War delivery systems and weapons to replacement systems and warheads and make decisions that will affect U.S. national security through the end of the 21st Century. To field a modern, threat-informed nuclear deterrent that will keep pace with evolving adversary capabilities, it is necessary to quantify and compare the relative performance contributions of a variety of military characteristics and weapons options to make data-driven decisions concerning the future of the U.S. nuclear deterrent.

This Program Element can fund travel to support the requirements of this program.

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support* | **R-1 Program Element (Number/Name)**<br>PE 0605161D8Z / *Nuclear Matters* |

This appropriation will finance work, including manpower, performed by a government agency or by private individuals or organizations under a contractual or grant arrangement with the government who conduct research (systematic study directed toward fuller scientific knowledge or understanding of the subject studied), development (systematic use of the knowledge and understanding gained from research, for the production of useful materials, devices, systems, or methods, including the design and development of prototypes and processes) and test and evaluation efforts.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 5.039 | 8.307 | 8.869 | - | 8.869 |
| Current President's Budget | 4.854 | 8.307 | 16.552 | - | 16.552 |
| Total Adjustments | -0.185 | 0.000 | 7.683 | - | 7.683 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | -0.184 | - | | | |
| • Other Program Adjustments | - | - | 7.700 | - | 7.700 |
| • Cancelled Accounts | -0.001 | - | - | - | - |
| • Economic Assumption | - | - | -0.017 | - | -0.017 |

**Change Summary Explanation**

Funding was increased in FY 2021 to address nuclear deterrent modeling and analysis to help make data-driven decisions for nuclear modernization efforts.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 6 | R-1 Program Element (Number/Name)<br>PE 0605161D8Z / *Nuclear Matters* | Project (Number/Name)<br>161 / *Nuclear Matters* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 161: *Nuclear Matters* | 32.441 | 4.854 | 8.307 | 16.552 | - | 16.552 | 16.901 | 17.277 | 17.617 | 17.816 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

The mission of the Nuclear Matters program is to sustain the U.S. nuclear deterrent posture, counter nuclear threats, and to develop nuclear and conventional physical security equipment. The funds for this program are used to support developmental and test and evaluation efforts as well as studies and analyses for nuclear weapons security; use control; nuclear weapons stockpile safety, survivability and performance; nuclear threat reduction and office management.

Funds are also used to develop and implement plans for stockpile transformation; infrastructure analyses, assessments and models; NWC activities, as mandated by Title 10 USC, section 179; radiological and nuclear emergency response efforts; and management of international programs of nuclear cooperation, particularly with respect to enhancing international nuclear safety and security.

Nuclear Matters is also responsible for policy development and implementation for personnel reliability; nuclear weapons, nuclear command and control, and special nuclear materials security; use control; nuclear weapons transportation; physical security equipment; countering nuclear threats; and nuclear and radiological incident response.

This appropriation will finance work, including manpower, performed by a government agency or by private individuals or organizations under a contractual or grant arrangement with the government who conduct research (systematic study directed toward fuller scientific knowledge or understanding of the subject studied), development (systematic use of the knowledge and understanding gained from research, for the production of useful materials, devices, systems, or methods, including the design and development of prototypes and processes) and test and evaluation efforts.

This Program Element can fund travel to support the requirements of this program.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Nuclear Weapons Council | 0.559 | 0.475 | 0.475 |
| ***Description:*** The NWC is a joint Department of Defense (DoD) and Department of Energy (DOE)/National Nuclear Security Administration (NNSA) organization established by Congress to facilitate cooperation and coordination between the two Departments as they fulfill their dual agency responsibilities for U.S. nuclear weapons stockpile management. | | | |
| ***FY 2020 Plans:***<br>- Oversee the activities on the Congressionally mandated Joint DoD-DOE NWC and its support committees to include the NWC Standing and Safety Committee, the Compartmented Advisory Committee and the Action Officer group | | | |
| ***FY 2021 Plans:*** | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
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| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0605161D8Z / *Nuclear Matters* | **Project (Number/Name)**<br>161 / *Nuclear Matters* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| - Continue to oversee the activities on the Congressionally mandated Joint DoD-DOE NWC and its support committees to include the Nuclear Weapons Council Standing and Safety Committee, the Compartmented Advisory Committee and the Action Officer group<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>No change. | | | |
| ***Title:*** International Programs<br><br>***Description:*** The United States also participates in several international programs of cooperation regarding nuclear weapons with foreign governments and regional defense organizations that involve unclassified and classified information exchanges. In general, these agreements are designed to promote safety and security, advance stockpile stewardship and collaborate in counter-proliferation efforts.<br><br>***FY 2020 Plans:***<br>- Execute confidence building programs of cooperation with international partners through Tri and Bi-lateral annual, bi-annual, and monthly engagements under Mutual Defense Agreements.<br>- Sponsor international partners at national-level nuclear weapons accident/incident exercises, workshops, render safe exercises through tri-lateral engagements under Mutual Defense Agreements.<br><br>***FY 2021 Plans:***<br>- Continue to confidence building programs of cooperation with international partners through Tri and Bi-lateral annual, bi-annual, and monthly engagements under Mutual Defense Agreements.<br>- Continue to sponsor international partners at national-level nuclear weapons accident/incident exercises, workshops, render safe exercises through tri-lateral engagements under Mutual Defense Agreements.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>No change. | 0.191 | 0.200 | 0.200 |
| ***Title:*** Nuclear Surety<br><br>***Description:*** Because of their political and military importance, destructive power, and the potential consequences of an accident or unauthorized act, nuclear weapons and nuclear weapon systems require special consideration--nuclear surety-- and must be protected against risks and threats inherent in their peacetime and wartime environments. Oversight of the DoD nuclear surety program is provided by Deputy Assistant Secretary of Defense for Nuclear Matters.<br><br>***FY 2020 Plans:***<br>- Conduct OSD oversight and provide direction for actions taken under DoDI 4540.05,Transportation of U.S. Nuclear Weapons; DoDD S-5210.81, United States Nuclear Weapons Command and Control, Safety, and Security; DoDI S-3150.07, Controlling | 0.660 | 0.745 | 0.745 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0605161D8Z / *Nuclear Matters* | **Project (Number/Name)**<br>161 / *Nuclear Matters* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| the Use of Nuclear Weapons and DoDI S-5210.82, Protection Nuclear Weapons Coding Equipment; DoDI 5210.42, “Nuclear Weapons Personnel Reliability Assurance” and DoDM 5210.42, Nuclear Weapons Personnel Reliability Program"; and DoDD 5210.41, Security Policy for Protecting Nuclear Weapons, DoDI O-5210.63, DoD Procedures for Security of Nuclear Reactors and Special Nuclear Materials, and DoD S-5210.92M, Physical Security for Nuclear Command and Control (NC2) Facilities.<br><br>- Manage the DoD Nuclear Exercise Program to inform risk based decisions and development of policy affecting nuclear security policy across the DoD Components by directing the DoD Force-on-Force Program; an exercise that evaluates the effectiveness of nuclear security policy through testing, evaluation, and analyses.<br>***FY 2021 Plans:***<br>- Continue to conduct OSD oversight and provide direction for actions taken under DoDI 4540.05,Transportation of U.S. Nuclear Weapons; DoDD S-5210.81, United States Nuclear Weapons Command and Control, Safety, and Security; DoDI S-3150.07, Controlling the Use of Nuclear Weapons and DoDI S-5210.82, Protection Nuclear Weapons Coding Equipment; DoDI 5210.42, “Nuclear Weapons Personnel Reliability Assurance” and DoDM 5210.42, Nuclear Weapons Personnel Reliability Program"; and DoDD 5210.41, Security Policy for Protecting Nuclear Weapons, DoDI O-5210.63, DoD Procedures for Security of Nuclear Reactors and Special Nuclear Materials, and DoD S-5210.92M, Physical Security for Nuclear Command and Control (NC2) Facilities.<br><br>- Continue to manage the DoD Nuclear Exercise Program to inform risk based decisions and development of policy affecting nuclear security policy across the DoD Components by directing the DoD Force-on-Force Program; an exercise that evaluates the effectiveness of nuclear security policy through testing, evaluation, and analyses.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>No change. | | | |
| ***Title:*** Stockpile Transformation<br><br>***Description:*** To meets its security needs and those of its allies, the U.S. will need a safe, secure, and reliable nuclear deterrent for the foreseeable future. There's increased risk, absent nuclear testing, in assuring long-term safety and reliability of today’s aging stockpile—the legacy warheads left over from the Cold War. Today’s nuclear weapons complex is not sufficiently “responsive” to technical problems in the stockpile, or to potential emerging threats. The task is to ensure the U.S. nuclear weapons stockpile and supporting infrastructure, meets long-term national security needs.<br><br>***FY 2020 Plans:***<br>- Conduct life cycle activities in support of the nuclear weapons stockpile under DoDD 3150.01, Joint DoD-DOE/NNSA Nuclear Weapon Life-Cycle Activities and DoDM 5030.55, DoD Procedures for Joint DoD-DOE Nuclear Weapons Life Cycle Activities.<br>- Manage DoD RDT&E activities for nuclear warheads to include B61, W76, W78, W80, B83, W87, W88 Weapons. | 1.223 | 3.126 | 3.062 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0605161D8Z / *Nuclear Matters* | **Project (Number/Name)**<br>161 / *Nuclear Matters* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| - Support studies for warhead replacement.<br><br>***FY 2021 Plans:***<br>- Continue to conduct life cycle activities in support of the nuclear weapons stockpile under DoDD 3150.01, Joint DoD-DOE/NNSA Nuclear Weapon Life-Cycle Activities and DoDM 5030.55, DoD Procedures for Joint DoD-DOE Nuclear Weapons Life Cycle Activities.<br>- Continue to manage DoD RDT&E activities for nuclear warheads to include B61, W76, W78, W80, B83, W87, W88 Weapons.<br>- Continue to support studies for warhead replacement.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The FY 2020 to FY 2021 decrease of $0.064 is the result of planned program changes in OUSD(A&S). | | | |
| ***Title:*** Survivability and Weapons of Mass Destruction (WMD)<br><br>***Description:*** In the 2010 Quadrennial Defense Review, the SECDEF directed the Department to rebalance its policy, doctrine, and capabilities to better support six key missions. The fifth on the list of key missions is to prevent proliferation and counter WMD. This project directly supports the nation's defense strategy.<br><br>***FY 2020 Plans:***<br>- Oversee the Nuclear Defense Portfolio.<br>- Plan and coordinate the activities of the National Nuclear Forensics Steering Committee and Working Group.<br>- Develop OSD-wide approach to overseeing Global Nuclear Defense missions within DoD.<br><br>***FY 2021 Plans:***<br>- Continue to oversee the Nuclear Defense Portfolio.<br>- Continue to plan and coordinate the activities of the National Nuclear Forensics Steering Committee and Working Group.<br>- Continue to develop OSD-wide approach to overseeing Global Nuclear Defense missions within DoD.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>No change. | 0.711 | 0.711 | 0.711 |
| ***Title:*** Nuclear Matters Support<br><br>***Description:*** Support to Nuclear Matters includes the following:<br><br>- Managing the operational, technical, and administrative support for the NWC and its subordinate bodies for a Safe, Secure, Effective, and Credible Nuclear Deterrent.<br>- Developing and coordinating all reports to the President and Congress as mandated by public law including the Report on Stockpile Assessments, Nuclear Weapons Stockpile Memorandum, NWC Certification of the NNSA Budget, Nuclear Weapons Stockpile Report, Joint Surety Report. Stockpile Stewardship and Management Plan, and Report on Platform Assessment. | 0.698 | 0.675 | 0.676 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0605161D8Z / *Nuclear Matters* | **Project (Number/Name)**<br>161 / *Nuclear Matters* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| - Developing technical content for briefings, reports, and decision letters; guides documents through coordination; and resolves issues within and between the agencies.<br>- Maintaining official records of NWC and subordinate body proceedings and other official documents.<br>- Reviewing and documenting Freedom of Information Act and Mandatory Declassification Requests (Annual average of over 500 nuclear-related requests).<br><br>***FY 2020 Plans:***<br>- Submit annual reports to the President and the Congress.<br>- Oversee DoD/DOE relationship regarding the survivability and surety of the national nuclear stockpile.<br>- Serve as DoD Sigma 15 Approval Authority (Interface with DOE/NNSA).<br>- Continue to adjudicate Freedom of Information Act and Mandatory Declassification Requests<br><br>***FY 2021 Plans:***<br>- Continue to submit annual reports to the President and the Congress.<br>- Continue to oversee DoD/DOE relationship regarding the survivability and surety of the national nuclear stockpile.<br>- Continue as DoD Sigma 15 Approval Authority (Interface with DOE/NNSA).<br>- Continue to address Freedom of Information Act and Mandatory Declassification Requests.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>No change. | | | |
| ***Title:*** Physical Security and PPBE Support<br><br>***Description:*** This support addresses program management, evaluation, and resourcing functions associated with the Physical Security Enterprise & Analysis Group (PSEAG), the Security Policy Verification Committee (SPVC), and Nuclear Threat Reduction (NTR) programs. This support also includes Planning, Programming, Budgeting and Execution (PPBE) for the Office of the Assistant Secretary of Defense for Nuclear, Chemical, and Biological Defense Programs and the Office of the Deputy Assistant Secretary of Defense for Nuclear Matters.<br><br>***FY 2020 Plans:***<br>- Assist with coordinating, planning and executing nuclear and conventional physical security development, test, evaluation and deployment of projects executed by the Military Departments by ensuring joint capability gaps are identified and to avoid duplication of effort across the DoD to maximize use of limited funds.<br><br>- Assist Nuclear Matters and the PSEAG pursue a joint-layered defense approach to Counter-Unmanned systems (C-UxS) by integrating sensors and systems into physical security architectures and command and control systems to address this threat. | 0.812 | 0.875 | 2.983 |

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| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0605161D8Z / *Nuclear Matters* | **Project (Number/Name)**<br>161 / *Nuclear Matters* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| - Coordinate efforts across DoD, interagency and international partners to develop C-UxS solutions that address the entire kill chain (Detect, Track, Identify, and Defeat) that support valid requirements while eliminating duplication of effort, pursuing the use of government and commercial off-the-shelf (GOTS/COTS) products, ensuring systems integration, and promoting interoperability and sustainability.<br><br>- Support all phases of the PPBE process and meet all mandated timelines for submission of related documents; contribute to the development of PPBE policy guidance for OASD(NCB); providing programmatic, business, financial, and policy assessments to the OASD(NCB); Maintaining and updating OASD(NCB) related funding profiles in official DoD financial databases and systems.<br>***FY 2021 Plans:***<br>Continue to support the following:<br>- Assist with coordinating, planning and executing nuclear and conventional physical security development, test, evaluation and deployment of projects executed by the Military Departments by ensuring joint capability gaps are identified and to avoid duplication of effort across the DoD to maximize use of limited funds.<br><br>- Assist Nuclear Matters and the PSEAG pursue a joint-layered defense approach to Counter-Unmanned systems (C-UxS) by integrating sensors and systems into physical security architectures and command and control systems to address this threat.<br><br>- Coordinate efforts across DoD, interagency and international partners to develop C-UxS solutions that address the entire kill chain (Detect, Track, Identify, and Defeat) that support valid requirements while eliminating duplication of effort, pursuing the use of government and commercial off-the-shelf (GOTS/COTS) products, ensuring systems integration, and promoting interoperability and sustainability.<br><br>- Support all phases of the PPBE process and meet all mandated timelines for submission of related documents; contribute to the development of PPBE policy guidance for OASD(NCB); providing programmatic, business, financial, and policy assessments to the OASD(NCB); Maintaining and updating OASD(NCB) related funding profiles in official DoD financial databases and systems.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The FY 2020 to FY 2021 increase of $2.125 million is the result of an add in the scope of work for C-UxS, physical security test and evaluation and SharePoint design and analysis. | | | |
| ***Title:*** Nuclear Deterrent Enterprise Review Group (NDERG) | - | 0.750 | 0.750 |
| ***Description:*** The NDERG is the principal integrated civilian-military governance body for the Department of Defense (DoD) Nuclear Enterprise. This oversight body, chaired by the Deputy Secretary of Defense and including the Vice Chairman of the Joint Chiefs of Staff and other senior leaders across the Department of Defense nuclear enterprise, was created to oversee and make decisions regarding implementation of recommendations from both the internal and external DoD nuclear enterprise reviews. The | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
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| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0605161D8Z / *Nuclear Matters* | **Project (Number/Name)**<br>161 / *Nuclear Matters* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| NDERG, in FY 2019, expanded its responsibility to provide advice and assistance to the Deputy Secretary of Defense on matters pertaining to management, operations, and health of the DoD Nuclear Enterprise. In addition, the NDERG will provide a forum for strategic-level coordination and integration of issues arising from the Department's other functional oversight committees and councils related to the nuclear enterprise.<br><br>The NDERG meets on a biennial basis and provides a forum for senior Defense leaders to identify, track, coordinate, and address issues, risks, and opportunities across the nuclear enterprise to ensure that outcomes of the 2014 Nuclear Enterprise Reviews, and outcomes of 2018 Nuclear Posture Review related to the health, management, and operations of the DoD Nuclear Enterprise, are pursued to completion.<br><br>***FY 2020 Plans:***<br>- The NDERG will oversee and synchronize all actions across the nuclear enterprise, including those from the Nuclear Posture Review (NPR) and any future reviews and/or assessments of any portion of the nuclear enterprise and is supported in its responsibilities by a next level down committee which meets on a quarterly basis and the action officer's group, which meets monthly.<br><br>- The NDERG, as recommended by the Deputy Secretary of Defense, will utilize the DoD Advana Shared Service Support to build a Nuclear Enterprise Dashboard (NED). The NED will be an automated nuclear enterprise-wide system capable for a variety of users to deduce insights, brief senior leadership, and improve the health of the nuclear enterprise. (Note: estimated cost is $2.99M for the most reliable, highest quality of control and assurance of data).<br>***FY 2021 Plans:***<br>- Continue to develop the NED to allow the Nuclear Community to gain immediate access to data, reducing build costs, development risks, and timeline to begin creating insights from NE data. Link NED to other Common Enterprise Databases to benefit from best practices and lessons learned from other DoD users, reducing the "learning cure" and speeding development timelines. (Note: estimated cost is $2.99M for the most reliable, highest quality of control and assurance of data).<br><br>- Continue to oversee and synchronize all actions across the nuclear enterprise, including those from the NPR and any future reviews and/or assessments of any portion of the nuclear enterprise and is supported in its responsibilities by a next level down committee which meets on a quarterly basis and the action officer's group, which meets monthly.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>No change. | | | |
| ***Title:*** Nuclear Incident Response and North Atlantic Treaty Organization (NATO) | - | 0.750 | 0.750 |

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| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0605161D8Z / *Nuclear Matters* | **Project (Number/Name)**<br>161 / *Nuclear Matters* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Description:*** In accordance with Presidential Policy Directive 35, US Nuclear Weapons Command and Control, Safety and Security and the DoD implementer, DoDD S-5210.81, the DoD will establish policy on nuclear weapons procedures for responding to U.S. nuclear weapons accidents and incidents and serve as the technical adviser to the Secretary of Defense in the event of a nuclear accident or incident. Coordinates with other U.S. Government Agencies and allies to ensure their standards complement DoD efforts for responding to accidents and incidents.<br><br>Regularly consult with NATO allies through the High Level Group (HLG—the senior advisory body to the NATO Nuclear Planning Group) subject matter experts and supports the Assistant Secretary of Defense for nuclear, Chemical and Biological Defense in their role as Vice-Chair of the HLG, comprised of national policy makers at the director level, and experts from Allied capitals.<br><br>***FY 2020 Plans:***<br>- Serve as Chair of the Nuclear Weapons Accident and Incident Subcommittee tasked in Federal response plans and national directives with the responsibility to coordinate and execute U.S. nuclear weapons incident and accident response policy.<br><br>- Coordinate overseas nuclear weapon storage and deployment issues with the Department of State, Combatant Commands, Services, and other DoD organizations.<br><br>- Direct the Nuclear Weapon Accident and Incident Exercises for the DoD, in coordination and cooperation with other U.S. Government Agencies (to include state/local/tribal) and NATO Partners.<br>***FY 2021 Plans:***<br>- Continue to Serve as Chair of the Nuclear Weapons Accident and Incident Subcommittee tasked in Federal response plans and national directives with the responsibility to coordinate and execute U.S. nuclear weapons incident and accident response policy.<br><br>- Continue to coordinate overseas nuclear weapon storage and deployment issues with the Department of State, Combatant Commands, Services, and other DoD organizations.<br><br>- Continue Nuclear Weapon Accident and Incident Exercises for the DoD, in coordination and cooperation with other U.S. Government Agencies (to include state/local/tribal) and NATO Partners.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>No change. | | | |
| ***Title:*** Nuclear Deterrent Model | 0.000 | - | 4.200 |
| ***Description:*** In order to overcome evolving threats to the U.S. nuclear deterrent, the NWC must understand the trade space, payoffs, challenges, and increases or decreases in effectiveness related to decisions regarding nuclear warheads and their | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0605161D8Z / *Nuclear Matters* | **Project (Number/Name)**<br>161 / *Nuclear Matters* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| associated delivery systems and platforms. Nuclear Matters is providing data-driven decision making and mission engineering support using a Tri-Lab effort (Los Alamos National Laboratory, Lawrence Livermore National Laboratory, and Sandia National Laboratories) that uses advanced physics-based and stochastic analytics to provide NWC decision makers with threat-informed choices regarding U.S. nuclear deterrent modernization and sustainment.<br><br>***FY 2021 Plans:***<br>Continue to expand and improve the nuclear deterrent model with analysis results that respond to the Nuclear Weapons Council in support of their strategic planning to include modernization strategies and stockpile composition assessments and investment tradeoffs.<br><br>Utilize the model to develop stockpile options, provide data to drive decisions concerning nuclear weapons program prioritization, and evaluate the capacity of the NNSA Nuclear Security Enterprise to support DoD military requirements.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The FY 2020 to FY 2021 increase of $4.2 million is the result of planned program changes in OUSD(A&S). | | | |
| ***Title:*** Nuclear Modernization<br>***Description:*** Assist with data driven decision making for nuclear modernization leveraging organizations like the Institution of Defense Analyses<br><br>***FY 2021 Plans:***<br>- Assist with data driven decision making for nuclear modernization leveraging organizations like the Institution of Defense Analyses<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The FY 2020 to FY 2021 increase of $2.0 million is the result of planned program changes in OUSD(A&S). | 0.000 | - | 2.000 |
| **Accomplishments/Planned Programs Subtotals** | 4.854 | 8.307 | 16.552 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support* | **R-1 Program Element (Number/Name)**<br>PE 0605170D8Z / *Support to Networks and Information Integration* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 71.017 | 11.042 | 9.441 | 9.582 | - | 9.582 | 8.983 | 8.888 | 8.885 | 9.063 | Continuing | Continuing |
| 170: *Support to NII* | 71.017 | 11.042 | 9.441 | 9.582 | - | 9.582 | 8.983 | 8.888 | 8.885 | 9.063 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

Funding supports Global Positioning System (GPS) User Equipment Synchronization with GPS space and operational control segments to conduct DoD CIO oversight of Global Positioning System (GPS) management and planning activities required for meeting JCIDs requirements. Funding supports policy and guidance for incorporation of alternative means of PNT delivery to augment GPS. Funding also supports the DoD's PNT Oversight Council and inputs into interagency activities under the National Space-Based Positioning, Navigation, and Timing Executive Committee.

In support of the National Defense Strategy (NDS), GPS continues to provide a force multiplier for the Joint Force and key US allies. Its modernization, and alternative, complement means of PNT provision will maintain this advantage. Superior PNT provides enhanced Joint Force lethality through precision targeting, exacting ISR, efficient logistics, blue force tracking, and a myriad of other force enhancements. These are enjoyed by the Joint Force and key US allies. As such, they ensure efficient and effective force employment.

The Integrated Planning and Management Project encompasses the Nuclear Management Office's (NMO) responsibilities for establishing overall DoD policy and oversight with respect to the capability development, interoperability, standards, and architecture for National Command Capabilities for our Nation's Senior Leadership. The NMO serves as the single point of contact within the Department for policy, long-range plans, programs and budget, integrated mission advocacy, and management of decision-maker capabilities. NMO's objective is to ensure capabilities are in place to provide complete and timely situational awareness and decision tools for senior decision-makers. Additionally, the NMO assists the DoD CIO as the Executive Agent and primary OSD advocate for the White House Military Office with oversight of a wide range of DoD command, control, and communications (C3) assets and oversees the efforts of the Services and Agencies in the design, integration, and deployment of critical and sensitive C3 capabilities. Two overall areas of focus include: 1) National Senior Leader C3 Systems, National Security/Emergency Preparedness (NS/EP), DoD support to Civil Authorities; Continuity of Government (COG); 2) Cyber Mission Indications and Warnings.

NMO provides guidance, oversight and policy direction support for Senior Leadership communications and Continuity communications which enable the National Security Strategy's "build a more lethal force" line of effort. By coordinating and integrating with the National Security Agency in the development of a security policy that provides guidance to the NMO community on cyber secure connection interfaces and security patterns on a continuous basis to addresses hardware, firmware and software vulnerabilities. Working with DISA, the Services, and other federal government agencies to ensure the safety of our Nation's critical undersea cable infrastructure. Provide guidance and oversight to all NMO cryptographic modernization programs, ensure NSA and the appropriate Service delivers their cryptographic capability on time and work with the combatant commanders' staff to ensure they have operationalized any potential risks with potential cryptographic program delays.

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support* | **R-1 Program Element (Number/Name)**<br>PE 0605170D8Z / *Support to Networks and Information Integration* |

Coordinate the DoD's critical time dissemination resiliency plans and initiatives with senior representatives from the precision, navigation and timing (PNT) community. Work with the Joint Staff, Army, Air Force, Navy, and Marine Corps to ensure their PNT plans include primary and alternate capabilities. Continue analysis of White House, DoD Services, DoD Agencies and Combatant Command initiatives to ensure the effectiveness of our airborne command, control and communications, commercial and military satellite communications, and their supporting ground infrastructure. Analysis will ensure our Senior Leadership C3 is operationally effective during all phases of a conflict.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 11.424 | 9.441 | 9.341 | - | 9.341 |
| Current President's Budget | 11.042 | 9.441 | 9.582 | - | 9.582 |
| Total Adjustments | -0.382 | 0.000 | 0.241 | - | 0.241 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | -0.380 | - | | | |
| • Financing Cancelled Account | -0.002 | - | - | - | - |
| • Program Budget Review | - | - | 0.250 | - | 0.250 |
| • Economic Assumptions | - | - | -0.009 | - | -0.009 |

**Change Summary Explanation**

FY19: BTR +1.746 million
FY19: SIBR/STTR Reduction -0.380 million.
FY19: Reprogramming FY19 Financing Cancelled Account Reduction -0.002 million.
FY21: Increase for IT Modernization (Classified) +0.250 million.
FY21: Defense-Wide Economic Assumptions -.009 million.

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Support to NII | 11.042 | 9.441 | 9.582 |
| ***FY 2020 Plans:***<br>Global Positioning System (GPS) User Equipment Synchronization with GPS space and control segments to conduct DoD CIO oversight of Global Positioning System (GPS) management and planning activities required for meeting JCIDs requirements and supporting the National Space-Based Positioning, Navigation and Timing Executive Committee. Funding will support:<br>- Manage the GPS Security Policy (DoDM-O4650.11). | | | |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support* | **R-1 Program Element (Number/Name)**<br>PE 0605170D8Z / *Support to Networks and Information Integration* |

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| - Manage the Information Assurance/COMSEC elements of DoDM-O4650.11.<br>- Develop Precisie Time and Time Interval (PTTI) Manual in DoDD 4650.05 family of PNT Issuances.<br>- Continue implementation of the GPS Protection Profile matrix from Navigation Warfare Concept of Operations in conjunction with Warfighting Operations Plans (OPLANS) and Contingency Plans (CONPLANS) in coordination with US STRATCOM.<br>- Manage PNT Navigation Warfare Instruction and Annexes to all the Operations Plans (OPLANS) and Contingency Plans (CONPLANS) in coordination with US STRATCOM.<br>- Manage NextGen interfaces with the GPS Wing, Joint Program Development Office (JPDO), and Air Force. Continue implementation of Red Key Sundown Policy.<br>- Provide staff support, perform research and conduct studies as directed by DEPSECDEF in his role as co-chair of the National Executive Committee for Space-Based PNT and for DoD CIO in his role as co-chair of the Executive Steering Group.<br>- Perform annual update of National Five-year Plan for Space-Based Positioning, Navigation and Timing (PNT).<br>- Apply Navigation Warfare Concept of Operations via the Joint Navigation Warfare Center (JNWC) and US STRATCOM to develop Doctrine, Tactics, Techniques and Procedures, Training, Equipment Validation and Material Solutions to Navigation Warfare challenges to the Military Services and Combatant Commanders in the scenarios defined in the CONPLANS and OPLANS.<br>- Manage and implement the DoD PNT investment strategy using the NetCentric Operations CPM portfolio to insure PNT material solutions are developed in a synchronized fashion in JCIDs, DAS, and PPBE.<br>- Implement additional Instructions (DoDIs) for public affairs and receiver certification, and DoDM for security policy.<br>- Manage inventory of DoD GPS receivers. Complete Roadmap of GPS UE fielding for MGUE.<br>- Analyze and promote alternative PNT delivery means for inclusion in the force structure for force protection. Develop Open Systems Architecture Standards for fielding of alternative PNT. Develop M&S tool for alternative PNT analysis.<br>- Biennially task Intelligence Community (IC) to assess threat vectors to GPS and other means of PNT delivery; biennial operational assessments to reveal gaps in PNT delivery against OPLANS and CONPLANS of COCOMS; maintenance of PNT equipment inventories, refreshed biennially.<br>- Develop Directives, Instructions, and Manuals for implementation of the PNT Strategy within the Department.<br>- Continue special task directed by DCIO to address acceleration of development and fielding of advanced GPS receivers in the Joint Force.<br>- Maintain and update inventory of existing GPS receiver equipage; expand to include antennae and antennae electronics; expand to include delivery of PNT via other-than-GPS equipment.<br>- Address prioritized platforms in fielding plans and guidance to Services.<br>- Develop MGUE “Roadmap” illustrating necessary fielding milestones for Joint Force MGUE equipage.<br>- Administer PNT Council within DoD via supporting DoDDs and DoDIs, agendas and minutes for Council meetings, Council task disposition and annual report to Congress. Chair and manage subordinate WGs for PNT Policy and NAVWAR. | | | |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support* | **R-1 Program Element (Number/Name)**<br>PE 0605170D8Z / *Support to Networks and Information Integration* |

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| - Address NATO PNT interoperability via STANAGs, Allied Navigation Plans, and associated documentation in NATO CaP-2 under C3 Board direction. Insure complementarity of allied equipage and planning based on USAF GPS development, open systems architecture development, and foreign PNT systems and capabilities.<br>- Insure cyber security of all elements of the Department PNT ecosystem. Assist civil Departments and Agencies, as required.<br><br>Integrated Planning and Management (NMO):<br>Continue NLCC Modeling and Simulation and Analysis – Continue to provide oversight and guidance to the DISA/JSEIO in developing end-to-end campaign-level modeling and simulation tools for NLCC. The research and development of the tools continued to increase the capabilities of MASSC (conferencing capabilities), NC3-N ExAMS (analysis of nodes, metrics and assets associated with a Navy communications system) and NISM (provide extendable, transparent multi-level simulation of scenarios). Deliverable will determine COCOM OPLAN risk in denied environments.<br><br>Provide oversight and guidance on Maritime Information Systems (MIS) and Submarine Fiber Optic Cables (SFOC) and associated infrastructure. These activities will encompass overseeing analysis of requirements, identifying communications capability shortfalls and interoperability issues, assessing equipment performance issues and exploring future communications improvements. This includes technical expertise and systems engineering expertise in support of acquisition, planning, procurement, installation, operations and sustainment of MIS and SFOC capabilities.<br><br>Provide technical expertise and oversight of Senior Leader C3 Systems and platforms including fixed and mobile communications capabilities of the White House, Secretary of Defense, Chairman of the Joint Chiefs of Staff, and other identified Senior Leaders. These activities will encompass consolidating Senior Leader operational mission requirements, identifying communications capability shortfalls and interoperability issues, assessing equipment performance issues and exploring future communications improvements.<br>***FY 2021 Plans:***<br>Global Positioning System (GPS) User Equipment Synchronization with GPS space and control segments to conduct DoD CIO oversight of Global Positioning System (GPS) management and planning activities required for meeting JCIDs requirements and supporting the National Space-Based Positioning, Navigation and Timing Executive Committee. Funding will support:<br>- Manage the GPS Security Policy (DoDM-O4650.11).<br>- Manage the Information Assurance/COMSEC elements of DoDM-O4650.11.<br>- Develop Precisie Time and Time Interval (PTTI) Manual in DoDD 4650.05 family of PNT Issuances.<br>- Continue implementation of the GPS Protection Profile matrix from Navigation Warfare Concept of Operations in conjunction with Warfighting Operations Plans (OPLANS) and Contingency Plans (CONPLANS) in coordination with US STRATCOM. | | | |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support* | **R-1 Program Element (Number/Name)**<br>PE 0605170D8Z / *Support to Networks and Information Integration* |

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| - Manage PNT Navigation Warfare Instruction and Annexes to all the Operations Plans (OPLANS) and Contingency Plans (CONPLANS) in coordination with US STRATCOM.<br>- Manage NextGen interfaces with the GPS Wing, Joint Program Development Office (JPDO), and Air Force. Continue implementation of Red Key Sundown Policy.<br>- Provide staff support, perform research and conduct studies as directed by DEPSECDEF in his role as co-chair of the National Executive Committee for Space-Based PNT and for DoD CIO in his role as co-chair of the Executive Steering Group.<br>- Perform annual update of National Five-year Plan for Space-Based Positioning, Navigation and Timing (PNT).<br>- Apply Navigation Warfare Concept of Operations via the Joint Navigation Warfare Center (JNWC) and US STRATCOM to develop Doctrine, Tactics, Techniques and Procedures, Training, Equipment Validation and Material Solutions to Navigation Warfare challenges to the Military Services and Combatant Commanders in the scenarios defined in the CONPLANS and OPLANS.<br>- Manage and implement the DoD PNT investment strategy using the NetCentric Operations CPM portfolio to insure PNT material solutions are developed in a synchronized fashion in JCIDs, DAS, and PPBE.<br>- Implement additional Instructions (DoDIs) for public affairs and receiver certification, and DoDM for security policy.<br>- Manage inventory of DoD GPS receivers. Complete Roadmap of GPS UE fielding for MGUE.<br>- Analyze and promote alternative PNT delivery means for inclusion in the force structure for force protection. Develop Open Systems Architecture Standards for fielding of alternative PNT. Develop M&S tool for alternative PNT analysis.<br>- Biennially task Intelligence Community (IC) to assess threat vectors to GPS and other means of PNT delivery; biennial operational assessments to reveal gaps in PNT delivery against OPLANS and CONPLANS of COCOMS; maintenance of PNT equipment inventories, refreshed biennially.<br>- Develop Directives, Instructions, and Manuals for implementation of the PNT Strategy within the Department.<br>- Continue special task directed by DCIO to address acceleration of development and fielding of advanced GPS receivers in the Joint Force.<br>- Maintain and update inventory of existing GPS receiver equipage; expand to include antennae and antennae electronics; expand to include delivery of PNT via other-than-GPS equipment.<br>- Address prioritized platforms in fielding plans and guidance to Services.<br>- Develop MGUE “Roadmap” illustrating necessary fielding milestones for Joint Force MGUE equipage.<br>- Administer PNT Council within DoD via supporting DoDDs and DoDIs, agendas and minutes for Council meetings, Council task disposition and annual report to Congress. Chair and manage subordinate WGs for PNT Policy and NAVWAR.<br>- Address NATO PNT interoperability via STANAGs, Allied Navigation Plans, and associated documentation in NATO CaP-2 under C3 Board direction. Insure complementarity of allied equipage and planning based on USAF GPS development, open systems architecture development, and foreign PNT systems and capabilities.<br>- Insure cyber security of all elements of the Department PNT ecosystem. Assist civil Departments and Agencies, as required. | | | |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support* | **R-1 Program Element (Number/Name)**<br>PE 0605170D8Z / *Support to Networks and Information Integration* |

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Integrated Planning and Management (NMO):<br>Continue NLCC Modeling and Simulation and Analysis – Continue to provide oversight and guidance to the DISA/JSEIO in developing end-to-end campaign-level modeling and simulation tools for NLCC. The research and development of the tools continued to increase the capabilities of MASSC (conferencing capabilities), NC3-N ExAMS (analysis of nodes, metrics and assets associated with a Navy communications system) and NISM (provide extendable, transparent multi-level simulation of scenarios). Deliverable will determine COCOM OPLAN risk in denied environments.<br><br>Provide oversight and guidance on Maritime Information Systems (MIS) and Submarine Fiber Optic Cables (SFOC) and associated infrastructure. These activities will encompass overseeing analysis of requirements, identifying communications capability shortfalls and interoperability issues, assessing equipment performance issues and exploring future communications improvements. This includes technical expertise and systems engineering expertise in support of acquisition, planning, procurement, installation, operations and sustainment of MIS and SFOC capabilities.<br><br>Provide technical expertise and oversight of Senior Leader C3 Systems and platforms including fixed and mobile communications capabilities of the White House, Secretary of Defense, Chairman of the Joint Chiefs of Staff, and other identified Senior Leaders. These activities will encompass consolidating Senior Leader operational mission requirements, identifying communications capability shortfalls and interoperability issues, assessing equipment performance issues and exploring future communications improvements.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>FY19: BTR +1.746 million<br>FY21: Defense-Wide Review increase for IT Modernization (Classified) +0.250 million. | | | |
| **Accomplishments/Planned Programs Subtotals** | 11.042 | 9.441 | 9.582 |

**D. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**E. Acquisition Strategy**

N/A

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 6: *RDT&E Management Support* | **R-1 Program Element (Number/Name)**<br>PE 0605200D8Z *I General Support to OUSD(I)* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 166.962 | 8.139 | 20.200 | 1.940 | - | 1.940 | 2.230 | 2.766 | 2.849 | 2.938 | Continuing | Continuing |
| 200: *General Spt to USDI* | 166.962 | 8.139 | 20.200 | 1.940 | - | 1.940 | 2.230 | 2.766 | 2.849 | 2.938 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

Funds are used to execute:

- Security Activities focus on technology development, automation, and modernization of capabilities across the Defense Security Enterprise to include Personnel Vetting, Physical Security, Industrial Security, and Critical Technology Protection. Activities also include proof of concept and application development related to enabling process improvement, efficiencies, and innovation.
- Intelligence, Surveillance, Reconnaissance (ISR) Operations requires expert engineering and technical assessments on a wide range of ISR operational issues. Funds will be used to support senior level discussions and decisions on ISR Operations related initiatives, platforms, and sensors.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 5.693 | 1.700 | 1.741 | - | 1.741 |
| Current President's Budget | 8.139 | 20.200 | 1.940 | - | 1.940 |
| Total Adjustments | 2.446 | 18.500 | 0.199 | - | 0.199 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | 2.327 | 18.500 | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | 0.119 | - | | | |
| • SBIR/STTR Transfer | - | - | | | |
| • Departmental Decision | - | - | 0.199 | - | 0.199 |

| Congressional Add Details ($ in Millions, and Includes General Reductions) | FY 2019 | FY 2020 |
|---|---|---|
| **Project:** 200: *General Spt to USDI* | | |
| Congressional Add: *Program Increase - Applied Research Laboratory for Intelligence and Security* | 0.000 | 12.000 |
| Congressional Add: *Program Increase* | 0.000 | 6.500 |
| Congressional Add Subtotals for Project: 200 | 0.000 | 18.500 |
| Congressional Add Totals for all Projects | 0.000 | 18.500 |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support* | **R-1 Program Element (Number/Name)**<br>PE 0605200D8Z / *General Support to OUSD(I)* |

**Change Summary Explanation**

Congressional increase to develop innovative technologies and solutions to enhance Federal Vetting Enterprise and protection of critical technologies. This is done in conjunction with interagency partners leveraging University Affiliated Research Center (UARC).

DWR: Defense-Wide (DW) Review FY2021 adjustments:
-$260K to reduce Talent Management
+$641K Increase for A&S Studies
-$182K Reduction for Studies

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 6 | R-1 Program Element (Number/Name)<br>PE 0605200D8Z / *General Support to OUSD(I)* | Project (Number/Name)<br>200 / *General Spt to USDI* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 200: *General Spt to USDI* | 166.962 | 8.139 | 20.200 | 1.940 | - | 1.940 | 2.230 | 2.766 | 2.849 | 2.938 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

Funds are used to execute:
- Technology development, automation, and modernization of capabilities across the Defense Security Enterprise to include Personnel Vetting, Physical Security, Industrial Security, and Critical Technology Protection. Activities also include proof of concept and application development related to enabling process improvement, efficiencies, and innovation.
- Intelligence, Surveillance, Reconnaissance (ISR) Operations requires expert engineering and technical assessments on a wide range of ISR operational issues. Funds will be used to support senior level discussions and decisions on ISR Operations related initiatives, platforms, and sensors.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** General Spt to USDI | 8.139 | 1.700 | 1.940 |
| ***Description:*** Funds are used to execute:<br>- Technology development, automation, and modernization of capabilities across the Defense Security Enterprise to include Personnel Vetting, Physical Security, Industrial Security, and Critical Technology Protection. Activities also include proof of concept and application development related to enabling process improvement, efficiencies, and innovation.<br>- Intelligence, Surveillance, Reconnaissance (ISR) Operations requires expert engineering and technical assessments on a wide range of ISR operational issues. Funds are used to support senior level discussions and decisions on ISR Operations related initiatives, platforms, and sensors. | | | |
| ***FY 2020 Plans:***<br>Security Activities: Provide technology development and concept evaluation for applications in support of OUSD(I).<br>ISR Ops: Provide expert engineering and technical assessments on a wide range of ISR operational issues. Funds are used to support senior level discussions and decisions on ISR Operations related initiatives, platforms, and sensors. | | | |
| ***FY 2021 Plans:***<br>Security Activities: Will continue to provide technology development and concept evaluation for applications in support of OUSD(I).<br>ISR Ops: Will continue to provide expert engineering and technical assessments on a wide range of ISR operational issues. Funds will be used to support senior level discussions and decisions on ISR Operations related initiatives, platforms, and sensors. | | | |
| ***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>DWR: Defense-Wide (DW) Review FY2021 adjustments: | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0605200D8Z / *General Support to OUSD(I)* | **Project (Number/Name)**<br>200 / *General Spt to USDI* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| -$260K to reduce Talent Management<br>+$641K Increase for A&S Studies<br>-$182K Reduction for Studies | | | |
| **Accomplishments/Planned Programs Subtotals** | 8.139 | 1.700 | 1.940 |

| | FY 2019 | FY 2020 |
|---|---|---|
| ***Congressional Add:*** Program Increase - Applied Research Laboratory for Intelligence and Security<br>***FY 2019 Accomplishments:*** N/A<br>***FY 2020 Plans:*** Congressional increase to develop innovative technologies and solutions to enhance Federal Vetting Enterprise and protection of critical technologies. This is done in conjunction with interagency partners leveraging University Affiliated Research Center (UARC). | 0.000 | 12.000 |
| ***Congressional Add:*** Program Increase<br>***FY 2019 Accomplishments:*** Congressional increase to develop innovative technologies and solutions to enhance Federal Vetting Enterprise and protection of critical technologies. This is done in conjunction with interagency partners leveraging University Affiliated Research Center (UARC).<br>***FY 2020 Plans:*** Develop innovative technologies and solutions to enhance Federal Vetting Enterprise and protection of critical technologies. This is done in conjunction with interagency partners leveraging University Affiliated Research Center (UARC). | 0.000 | 6.500 |
| **Congressional Adds Subtotals** | 0.000 | 18.500 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 6: *RDT&E Management Support* | **R-1 Program Element (Number/Name)**<br>PE 0605502D8Z *I Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR)* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | - | 122.216 | 0.000 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| 502: *SBIR* | - | 122.216 | 0.000 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

The goals of the Department of Defense (DoD) Office of the Secretary of Defense (OSD) Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs are to stimulate technological innovation, increase private sector commercialization of federal research and development (R&D), increase small business participation in federally funded R&D, and foster participation by minority and disadvantaged firms in technological innovation. The SBIR and STTR programs are critical pathways for the Department to tap the innovation of America's small business community and research institutions to support development of cutting-edge technologies that will increase the readiness, modernization and lethality of the Joint Force.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 0.000 | 0.000 | 0.000 | - | 0.000 |
| Current President's Budget | 122.216 | 0.000 | 0.000 | - | 0.000 |
| Total Adjustments | 122.216 | 0.000 | 0.000 | - | 0.000 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | 122.216 | - | | | |

**Change Summary Explanation**

Funds are allocated from other OSD programs and select Defense Agencies to support the SBIR and STTR programs as defined in 15 U.S.C. 638 (f) and (n).

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0605502D8Z / *Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR)* | **Project (Number/Name)**<br>502 / *SBIR* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 502: *SBIR* | - | 122.216 | 0.000 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

The goals of the Office of the Secretary of Defense (OSD) Small Business Innovation Research (SBIR) program is to stimulate technological innovation, increase private sector commercialization of federal research and development (R&D), increase small business participation in federally funded R&D, and foster participation by minority and disadvantaged firms in technological innovation. Leveraging the innovation of small business concerns is an important contributor to the development of the cutting-edge technologies that will generate decisive and sustained U.S. military advantages by increasing the readiness, modernization and lethality of the Joint Force. This program supports high priority projects within the DoD Components, their missions, and the Warfighter.

The goals of the OSD Small Business Technology Transfer (STTR) program is to stimulate a partnership of ideas between small business concerns (SBCs) and research institutions through DoD funded research or research and development (R/R&D). By providing awards to SBCs or cooperative R/R&D efforts with research institutions, DoD supports innovation and economic growth to generate decisive and sustained U.S. military advantages. This program supports high priority projects within the DoD Components, their missions, and the Warfighter.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** SBIR | 108.644 | - | - |
| ***Description:*** The set-aside program for small business supports mission-oriented R&D with the goal of providing advanced capabilities to the Warfighter and commercializing those technologies, resulting in a vibrant small business innovation base supporting economic growth and technology innovation.<br><br>The SBIR program contributed to the readiness and modernization of the Joint Force and improved operational capabilities through 164 innovative research projects in the following areas:<br>• Special Operations: Color Night Vision; Unmanned Aerial Vehicle Durability; Tactical Data Processing, Exploitation and Dissemination; Field Cooling and Storage for Blood and Pharmaceuticals; Standoff Chemical Detector;<br>• Strategic Capabilities: Hypersonic Electro-Optical Seeker; High Acceleration and Hypervelocity Inertial Measurement Unit; High-Resolution/High-Sensitivity Video Seeker;<br>• Logistics: Additive Manufacturing for Improved Survivability and Cost Reduction; Reverse Engineering for Alternative Sources of Supply; Nutrient-Dense Soldier Food Bar Ration; NanoSonic Seals for Supply Chain Management; Tamper Resistant/Anti-Counterfeit Package Labelling; | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0605502D8Z / *Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR)* | **Project (Number/Name)**<br>502 / *SBIR* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| • Missile Defense: Ballistic Missile Defense System-Level Simulation Optimization; Distributed Real-Time Information Assurance Management Technologies; Divert and Attitude Control Systems; Debris Modelling;<br>• Defense Advanced Research Projects: Hybrid Off-Road Motorcycle; Tools for Understanding Human Social Systems; Gun-Launched Integrated Guidance, Navigation and Control System; Load Bearing Thermal Protection Structure for Hypersonic Flight;<br>• Advanced Small Arms Ammunition: Techniques for Caseless Ammunition; Active Noise Control for Small Arms Ammunition; Conductive Propellant Additives for Electrical Ignition; Small Arms Neural-Network Automatic Target Classification System;<br>• Cybersecurity: Cyber Deception for Network Defense; Cyber Defense Ranking and Prioritization of Attack-related Events; Cyber Physical Security for Tactical Systems; Network Isolation of Industrial Control Systems; and<br>• Geospatial Intelligence: Machine Learning to Suppress False Alarms in Automated Target Recognizers; Automated Assessment of Urban Environment Degradation for Disaster Relief and Reconstruction.<br><br>Emerging Results from SBIR Investments in FY 2018:<br>• The SilentHawk all-wheel drive hybrid-electric military motorcycle prototype enables troops to rapidly and quietly move through rugged terrain with up to 170 miles of range and two hours of quiet mode.<br>• An extended range synthetic aperture radar system that tracks people and vehicles in all weather, day or night, using a ground moving target indicator is now moving into a DoD Program of Record.<br>• An additive manufacturing project to make seamless fuel bladders for helicopters is reinventing a manufacturing process unchanged since World War II, showing promising improvements that will extend service life by 50%, reduce weight by 20%, and reduce total cost of ownership by 40%.<br>• Government testers evaluated small arms stabilization systems with very favorable results that are pending future investment decisions.<br>• A subsurface diver tracking and communications system showed very positive results and is pending review and transition into a program of record.<br>• A mechanism to enable divers to lock-in and lock-out of a submersible transport system demonstrated attributes desired by managers of a program of record.<br><br>The Congressionally directed reorganization of the Office of the Secretary of Defense and the subsequent reprioritization of DoD research will result in the following areas receiving the bulk of future resource commitments:<br>• Artificial Intelligence: Improve algorithms, address data quality, optimize human-machine coordination and disrupt adversaries' efforts;<br>• Autonomy: Address teaming of autonomous systems; machine perception, reasoning and intelligence; human and autonomy systems trust and interaction; | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0605502D8Z / *Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR)* | **Project (Number/Name)**<br>502 / *SBIR* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| • Communications: Addressing high-performance, low power embedded processing and developing algorithms for self-configuring, self-healing and resource allocation;<br>• Cyber: Address behavioral issues, develop self-securing networks and develop methodologies to assess cyber effects and consequences;<br>• Directed Energy: Address power scaling, jitter reduction, laser size and weight, adaptive optics, beam propagation and target tracking;<br>• Hypersonics: Address high temperature materials, hypersonic vehicle manufacturing, air breathing propulsion and hypersonic guidance and control systems;<br>• Microelectronics: Develop domestic capabilities through small business investments;<br>• Quantum Sciences: Address quantum clocks and sensors, quantum communications technologies and develop enabling technologies for quantum computing in the areas of cryogenics and photon detection; and<br>• Space: Developing Low Earth Orbit nano-satellites for missile warning, intelligence, surveillance, reconnaissance, navigation and communications. | | | |
| ***Title:*** STTR<br><br>***Description:*** The set-aside program that funds cooperative R/R&D projects for small businesses in partnership with research institutions.<br><br>The STTR program contributed to the readiness and modernization of the Joint Force and improved operational capabilities through nine innovative research projects in the following areas:<br>• Special Operations: Situational Awareness;<br>• Chemical/Biological Defense: Mitigation of Radiation Effects; Electromagnetic Pulse and High Power Microwave Protection Systems;<br>• Defense Advanced Research Projects: Radio Frequency Emitter-Localization for Complex Environments; Portable Lasers; Visual Recognition System;<br>• Additive Manufacturing: Low Cost Phased Array Manufactured by 3D Printing; and<br>• Geospatial Intelligence: Algorithms for Look-down Infrared Target Exploitation.<br><br>Emerging results from the nine STTR projects are unavailable due to project immaturity.<br><br>The Congressionally directed reorganization of the Office of the Secretary of Defense and the subsequent reprioritization of DoD research will result in the following areas receiving the bulk of future resource commitments: | 13.572 | - | - |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0605502D8Z / *Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR)* | **Project (Number/Name)**<br>502 / *SBIR* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| • Artificial Intelligence: Improve algorithms, address data quality, optimize human-machine coordination and disrupt adversaries' efforts;<br>• Autonomy: Address teaming of autonomous systems; machine perception, reasoning and intelligence; human and autonomy systems trust and interaction;<br>• Communications: Addressing high-performance, low power embedded processing and developing algorithms for self-configuring, self-healing and resource allocation;<br>• Cyber: Address behavioral issues, develop self-securing networks and develop methodologies to assess cyber effects and consequences;<br>• Directed Energy: Address power scaling, jitter reduction, laser size and weight, adaptive optics, beam propagation and target tracking;<br>• Hypersonics: Address high temperature materials, hypersonic vehicle manufacturing, air breathing propulsion and hypersonic guidance and control systems;<br>• Microelectronics: Develop domestic capabilities through small business investments;<br>• Quantum Sciences: Address quantum clocks and sensors, quantum communications technologies and develop enabling technologies for quantum computing in the areas of cryogenics and photon detection; and<br>• Space: Developing Low Earth Orbit nano-satellites for missile warning, intelligence, surveillance, reconnaissance, navigation and communications. | | | |
| **Accomplishments/Planned Programs Subtotals** | 122.216 | - | - |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 6: *RDT&E Management Support* | **R-1 Program Element (Number/Name)**<br>PE 0605790D8Z *I Small Business Innovation Research (SBIR)/Small Business Technology Transfer (STTR)* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 2.367 | 2.539 | 3.568 | 3.582 | - | 3.582 | 3.639 | 3.688 | 3.757 | 3.814 | Continuing | Continuing |
| 518: *SBIR/Challenge Admin* | 2.367 | 2.539 | 3.568 | 3.582 | - | 3.582 | 3.639 | 3.688 | 3.757 | 3.814 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

This Program Element (PE) provides funding for the administration of the Department of Defense (DOD) Small Business Innovation Research (SBIR) Program and the Small Business Technology Transfer (STTR) Program. The DOD SBIR/STTR Program funds over one billion dollars annually in mission oriented research and development (R&D) projects via small technology companies. The purpose of the program is to stimulate technological innovation, increase private sector commercialization of Federal R&D, increase small business participation in Federally funded R&D, foster participation by minority and disadvantaged firms in technological innovation, and cultivate cooperative research & technology transfer between small business and research institutions. The SBIR/STTR Program is codified in 15 USC 638. The SBIR/STTR Programs competitively fund scientific and technical innovation to specifically address the mission needs of participating DOD components.

DOD components participating in the SBIR and STTR Program include the: Army, Navy, Air Force, Defense Advanced Research Projects Agency (DARPA), Missile Defense Agency (MDA), Defense Threat Reduction Agency (DTRA), U.S. Special Operations Command (SOCOM), Joint Science & Technology Office for Chemical & Biological Defense (CBD), National Geospatial-Intelligence Agency (NGA), the Defense Logistics Agency (DLA), the Defense Microelectronics Activity (DMEA), the Defense Health Agency (DHA) and the Office of Secretary of Defense (OSD).

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 2.539 | 3.568 | 3.616 | - | 3.616 |
| Current President's Budget | 2.539 | 3.568 | 3.582 | - | 3.582 |
| Total Adjustments | 0.000 | 0.000 | -0.034 | - | -0.034 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | - | - | | | |
| • Other | - | - | -0.030 | - | -0.030 |
| • Economic Assumption | - | - | -0.004 | - | -0.004 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 6 | R-1 Program Element (Number/Name)<br>PE 0605790D8Z / *Small Business Innovation Research (SBIR)/Small Business Technology Transfer (STTR)* | Project (Number/Name)<br>518 / *SBIR/Challenge Admin* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 518: *SBIR/Challenge Admin* | 2.367 | 2.539 | 3.568 | 3.582 | - | 3.582 | 3.639 | 3.688 | 3.757 | 3.814 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

The SBIR/STTR Program is executed in three phases. The purpose of Phase I is to determine, insofar as possible, the scientific technical and commercial merit, and feasibility of ideas submitted under the SBIR/STTR Program. Phase II is the principal research or research and development effort and is expected to produce a well-defined deliverable prototype. Phase III SBIR/STTR efforts derive from, extend or conclude Phase I or Phase II efforts, and are not funded with SBIR/STTR funds. Under Phase III, companies participating in the SBIR/STTR Program are expected to obtain funding from the private sector and/or non-SBIR/ STTR government sources to develop the prototype into a viable product or non-R&D service for sale in military and/or private sector markets. This PE funds the administrative support to the SBIR/ STTR programs including policy development, monitoring program execution for participating DOD agencies, outreach to small businesses, training for DOD small business and contracting professionals, and an annual conference to bring together the stakeholders for networking and program updates.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** SBIR/Challenge Admin | 2.539 | 3.568 | 3.582 |
| ***Description:*** Program element (PE) 0605790D8Z is the only source of funds for the coordination, administration and execution of the Department's SBIR/STTR Programs. The Director, DOD SBIR/STTR Programs is tasked with providing Departmental SBIR/ STTR policy guidance, oversight and implementation and therefore requires program element (PE) 0605790D8Z to fund these administrative activities. In addition to funding costs for program administration, coordination and execution, PE 0605790D8Z funds essential tasks of the SBIR/STTR Program that are required by law including:<br>(1) Coordinate and execute the administrative portions of the DOD SBIR/STTR Programs including the development of technical topics, preparation of SBIR/STTR R&D solicitations and receipt of proposal responses;<br>(2) Maintain and modify automated processes across the entire SBIR/STTR lifecycle including the development and maintenance of information systems and software required for the measurement, evaluation, and effective management of the Department's SBIR/STTR Programs;<br>(3) Conduct an outreach program including the execution of two National conferences and outreach to small technology companies, potential investors in such companies, small disadvantaged businesses (SDBs), woman owned small businesses (WOSBs), Institutions of Higher Learning, underrepresented states, and others, to facilitate participation in the SBIR/STTR Programs;<br>(4) Coordinate oversight, collect results, track execution and provide reporting of Phase II technology transition in the DOD SBIR Commercialization Readiness Program (CRP); and<br>(5) Prepare all reports mandated by law and policy. | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0605790D8Z / *Small Business Innovation Research (SBIR)/Small Business Technology Transfer (STTR)* | **Project (Number/Name)**<br>518 / *SBIR/Challenge Admin* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***FY 2020 Plans:***<br>Program element (PE) 0605790D8Z is the only source of funds for the coordination, administration and execution of the Department's SBIR/STTR Programs. The Director, DOD SBIR/STTR Programs is tasked with providing Departmental SBIR/ STTR policy guidance, oversight and implementation and therefore utilizes program element (PE) 0605790D8Z to fund these administrative activities. In addition to funding costs for program administration, coordination and execution, PE 0605790D8Z funds essential elements of the SBIR/STTR Program that are required by law including:<br>(1) Coordinate and execute the administrative portions of the DOD SBIR/STTR Programs including the development of technical topics, preparation of SBIR/STTR R&D solicitations and receipt of proposal responses;<br>(2) Maintain and modify automated processes across the entire SBIR/STTR lifecycle including the development and maintenance of information systems and software required for the measurement, evaluation, and effective management of the Department's SBIR/STTR Programs;<br>(3) Conduct an outreach program including the execution of two National conferences and outreach to small technology companies, potential investors in such companies, SDBs, WOSBs, Institutions of Higher Learning, underrepresented states, and others, to facilitate participation in the SBIR/STTR Programs;<br>(4) Coordinate oversight, collect results, track execution and provide reporting of Phase II technology transition results from the DOD SBIR Commercialization Readiness Program (CRP); and<br>(5) Prepare all reports mandated by law and policy. | | | |
| ***FY 2021 Plans:***<br>Program element (PE) 0605790D8Z is the only source of funds for the coordination, administration and execution of the Department's SBIR/STTR Programs. The Director, DOD SBIR/STTR Programs is tasked with providing Departmental SBIR/ STTR policy guidance, oversight and implementation and therefore utilizes program element (PE) 0605790D8Z to fund these administrative activities. In addition to funding costs for program administration, coordination and execution, PE 0605790D8Z funds essential elements of the SBIR/STTR Program that are required by law including:<br>(1) Coordinate and execute the administrative portions of the DOD SBIR/STTR Programs including the development of technical topics, preparation of SBIR/STTR R&D solicitations and receipt of proposal responses;<br>(2) Maintain and modify automated processes across the entire SBIR/STTR lifecycle including the development and maintenance of information systems and software required for the measurement, evaluation, and effective management of the Department's SBIR/STTR Programs;<br>(3) Conduct an outreach program including the execution of two National conferences and outreach to small technology companies, potential investors in such companies, SDBs, WOSBs, Institutions of Higher Learning, underrepresented states, and others, to facilitate participation in the SBIR/STTR Programs; | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0605790D8Z / *Small Business Innovation Research (SBIR)/Small Business Technology Transfer (STTR)* | **Project (Number/Name)**<br>518 / *SBIR/Challenge Admin* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| (4) Coordinate oversight, collect results, track execution and provide reporting of Phase II technology transition results from the DOD SBIR Commercialization Readiness Program (CRP); and<br>(5) Prepare all reports mandated by law and policy.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Under Program element (PE) 0605790D8Z the DOD SBIR/STTR Program Office utilizes this sole source of funds for the coordination, administration and execution of DOD's SBIR/STTR Programs. The various areas that are administered require continuous enhancements for stakeholders to successfully participate in these programs. This results in a need for an increase to the funding source. This increase addresses enhancements to the outreach, collection and reporting portion of the program as well as training - more specifically fraud waste and abuse training required by law with respect to the participation in these programs. | | | |
| **Accomplishments/Planned Programs Subtotals** | 2.539 | 3.568 | 3.582 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Not applicable for this item.

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support* | **R-1 Program Element (Number/Name)**<br>PE 0605797D8Z / *Maintaining Technology Advantage* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 0.000 | 0.000 | 20.936 | 29.566 | - | 29.566 | 29.149 | 29.379 | 29.772 | 30.174 | Continuing | Continuing |
| 138: *S&T Protection* | 0.000 | 0.000 | 10.344 | 9.345 | - | 9.345 | 7.210 | 7.005 | 7.228 | 7.406 | Continuing | Continuing |
| 139: *Joint Acquisition Protection Exploitation Cell (JAPEC)* | 0.000 | 0.000 | 5.592 | 7.157 | - | 7.157 | 7.295 | 7.400 | 7.548 | 7.671 | Continuing | Continuing |
| 158: *Program and Technology Protection* | 0.000 | 0.000 | 5.000 | 6.354 | - | 6.354 | 6.480 | 6.361 | 4.996 | 5.097 | Continuing | Continuing |
| 043: *Technology Innovation Base* | 0.000 | 0.000 | 0.000 | 6.710 | - | 6.710 | 8.164 | 8.613 | 10.000 | 10.000 | Continuing | Continuing |

**Note**

This continuity of effort is being transferred from the Defense Technical Analysis PE 0605798D8Z and the Systems Engineering PE 0605142D8Z beginning in FY 2020 to more appropriately align the efforts within the current Office of the Under Secretary of Defense for Research and Engineering (OUSD(R&E)) organization.

**A. Mission Description and Budget Item Justification**

This Program Element provides funding to support efforts to maintain DoD's technology advantage. The targeting of U.S. capabilities by our strategic competitors create the potential to degrade core U.S. military technological advantages through unwanted technology transfer. The technology transfer, primarily unclassified technology, threatens DoD's ability to maintain the technology advantage required to support the lethality and survivability of the Joint Force. DoD is executing a campaign plan to maintain DoD's technology advantage. First, DoD is promoting strategic technology investment to provide DoD access to new and innovative technology. These investments are required to create breakthroughs in key areas of basic research, foster transition and decrease time to market of applied research to economically viable companies, and harvest U.S. innovation or with likeminded allies.

Secondly, DoD must ensure its strategic technology investments are protected against unwanted technology transfer by developing and maintaining the tools and techniques that enable the U.S. engage in technology transfer at the time, place, and parties of our choosing.

Thirdly, DoD must combat adversaries' attempts to thwart U.S. technology security mechanisms to control technology transfer. The Department will support these three efforts by developing the appropriate suite of analytic tools, a data acquisition strategy, and utilize program protection activities to address the threat over the long term. Program Protection Planning includes protection of critical program information, critical components and mission functions, and integrates high level security policies and practical expertise to specific RDA practices, systems engineering activities, and risk reduction activities. Through this initiative the Department is maturing system security engineering methodologies to protect controlled unclassified information, to include controlled technical information on contractor networks; improve mitigation of supply chain risk management risks, improve integration of cybersecurity into the engineering processes, mature processes to identify Critical Program Information integration of defense exportability features and improve program protection planning.

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 6: *RDT&E Management Support* | **R-1 Program Element (Number/Name)**<br>PE 0605797D8Z *I Maintaining Technology Advantage* |

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 0.000 | 19.936 | 19.748 | - | 19.748 |
| Current President's Budget | 0.000 | 20.936 | 29.566 | - | 29.566 |
| Total Adjustments | 0.000 | 1.000 | 9.818 | - | 9.818 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | -2.000 | | | |
| • Congressional Adds | - | 3.000 | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | - | - | | | |
| • Other | - | - | -0.162 | - | -0.162 |
| • Internal Re-alignment | - | - | 10.000 | - | 10.000 |
| • Economic Assumption | - | - | -0.020 | - | -0.020 |

| Congressional Add Details ($ in Millions, and Includes General Reductions) | FY 2019 | FY 2020 |
|---|---|---|
| **Project:** 138: *S&T Protection* | | |
| Congressional Add: *Securing American Science and Technology* | - | 3.000 |
| Congressional Add Subtotals for Project: 138 | - | 3.000 |
| Congressional Add Totals for all Projects | - | 3.000 |

**Change Summary Explanation**

This continuity of effort is being transferred from the Defense Technical Analysis PE 0605798D8Z and the Systems Engineering PE 0605142D8Z beginning in FY 2020 to more appropriately align the efforts within the current OUSD(R&E) organization.

FY 2020:
-$2.000 million decease for excess growth
$3.000 million increase for Securing American Science and Technology

FY 2021 Internal Realignment for Higher Priorities includes:
$10.000 million adjustment to support DoD priorities

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 6 | R-1 Program Element (Number/Name)<br>PE 0605797D8Z / *Maintaining Technology Advantage* | Project (Number/Name)<br>138 / *S&T Protection* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 138: *S&T Protection* | 0.000 | 0.000 | 10.344 | 9.345 | - | 9.345 | 7.210 | 7.005 | 7.228 | 7.406 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

As the Department develops advanced technologies, it must use a rigorous, repeatable methodology to protect technology advantage beyond current Program Protection Planning policy. The production of Technology Area Protection Plans (TAPPs) will generate consistent and balanced protection of critical technology, provide foundational guidance for communicating about the technology to particular audiences, and inform protection and controls for the technology. This will encompass the lifecycle of basic and applied research, advanced technology development, prototyping, and technology transition to programs. The Department will establish policy to protect critical technology in S&T investments through program protection. The implementation of these policies and TAPPs will have broad impacts across DoD and interagency-wide activities associated with critical technologies, including export controls, Committee on Foreign Investment in the United States (CFIUS) mitigations, Foreign Investment Risk Review Modernization Act (FIRRMA) decisions, international agreements, counterintelligence and law enforcement priorities, and development of protection practices with DoD research performers (e.g., DoD and national laboratories, academia, small businesses, and the broader innovation base).

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Science and Technology (S&T) Protection | - | 7.344 | 9.345 |
| ***Description:*** This project supports efforts to maintain DoD's technology advantage by establishing activities to promote and ensure accountability for mitigating adversary exploitation of technologies critical to national security objectives. This project will develop and oversee S&T policy and practices for informed horizontal protection of emerging and critical technology areas. | | | |
| ***FY 2020 Plans:***<br>The program continues to collect and integrate proactive protection efforts focused on the S&T community.<br><br>- Generates Technology Area Protection Plan (TAPP) framework, develops communication procedures, and initiates data gathering for modernization initiatives and critical technology areas.<br>- Develops/updates Controlled Technical Information (CTI) threshold determinations to inform grants, OTAs, contracted activities.<br>- Initiates consistent, horizontal security classification in each modernization initiative/critical technology areas by developing and maintaining a single Security Classification Guide for each modernization initiative/technology area.<br>- Initiates S&T protection curriculum development. | | | |
| ***FY 2021 Plans:***<br>The program will continue efforts to address S&T protection activities:<br>- Establish/oversee S&T protection policy guidance.<br>- Produce, deploy and maintain TAPPs for each modernization initiative/critical technology area. | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0605797D8Z / *Maintaining Technology Advantage* | **Project (Number/Name)**<br>138 / *S&T Protection* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| - Deliver/deploy S&T protection curriculum to S&T/Acq program and Protection (IC/CI/Security) work force.<br>- Engage Universities, UARCs, DoD Laboratories and develop/deploy tailored S&T protection practices and lessons learned.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Level of effort is decreases in FY 2020 due to congressional reduction. Level of effort remains consistent starting in FY 2021. | | | |
| **Accomplishments/Planned Programs Subtotals** | - | 7.344 | 9.345 |

| | FY 2019 | FY 2020 |
|---|---|---|
| ***Congressional Add:*** Securing American Science and Technology | - | 3.000 |
| ***FY 2020 Plans:*** This FY 2020 congressional add:<br>- Initiates engagement with Academic community and development of education and training activities for S&T Protection.<br>- Initiates S&T protection policy review.<br>- Initiates assessments of potential consequences that any proposed practices would have on international collaboration and United States leadership in science and technology. | | |
| **Congressional Adds Subtotals** | - | 3.000 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 6 | R-1 Program Element (Number/Name)<br>PE 0605797D8Z / *Maintaining Technology Advantage* | Project (Number/Name)<br>139 / *Joint Acquisition Protection Exploitation Cell (JAPEC)* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 139: *Joint Acquisition Protection Exploitation Cell (JAPEC)* | 0.000 | 0.000 | 5.592 | 7.157 | - | 7.157 | 7.295 | 7.400 | 7.548 | 7.671 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

DoD established a joint analysis capability (Joint Acquisition Program and Exploitation Cell (JAPEC)) to conduct comprehensive assessments of controlled unclassified technical information losses, and engage acquisition and intelligence sources, to determine consequences and appropriate preventative/mitigation actions. The JAPEC requires the ability to detect and characterize past technology losses, conduct damage assessments of lost information, and provide various insights with predictive value. Together with supporting organizations, the JAPEC enables comprehensive, detailed assessments of U.S. military technological vulnerability, as well as inform the development and application of effective policies, countermeasures, and enforcement actions to preserve U.S. technical superiority in all warfighting domains.

JAPEC, and supporting organizations, require an analytic capability to synchronize, integrate, coordinate and inform DoD efforts in order to protect the acquisition and investment in sensitive U.S. technologies from adversaries and better exploit opportunities to deter, deny and disrupt adversary activities. JAPEC will conduct trend analysis of protection efforts for the Department's critical acquisition programs and technologies, incorporate findings into protection processes and activities, and analyze losses, to determine consequences and appropriate requirements, acquisition, programmatic, and strategic courses of action to include deterring our strategic competitors and identifying opportunities to promote our innovation base.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Joint Acquisition Protection Exploitation Cell (JAPEC) | - | 5.592 | 7.157 |
| ***Description:*** Integrate controlled unclassified information, to include Controlled Technical Information (CTI) protection efforts across DoD to proactively mitigate losses and exploit opportunities to deter, deny, and disrupt adversaries that may threaten U.S. military advantage. | | | |
| ***FY 2020 Plans:***<br>- Identify critical acquisition programs and technologies requiring elevated protection.<br>- Support proactive protection actions for critical programs and technologies.<br>- Support specialized protection activities to combat strategic competitor illicit transfer of technology.<br>- Provide protection analysis in support of international partner agreements<br>- Identify threats and recommend advanced protection mechanisms within and across DoD programs/technologies.<br>- Support assessment of vulnerabilities associated with known losses.<br>- Support specialized protection activities to combat strategic competitor illicit transfer of technology. | | | |
| ***FY 2021 Plans:*** | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0605797D8Z / *Maintaining Technology Advantage* | **Project (Number/Name)**<br>139 / *Joint Acquisition Protection Exploitation Cell (JAPEC)* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| - Partner and develop international (bilateral/multilateral) protection practices with select allies.<br>- Develop and coordinate operationalization of critical program and technology enhanced protection.<br>- Scale National Cyber Incident Joint Task Force (NCIJTF)/MDCO/national law enforcement to provide targeted engagements.<br>- Develop and implement uniform Critical Program Information (CPI) Identification and Protection.<br>- Scale specialized protection activities to combat strategic competitor illicit transfer of technology.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Level of effort increase reflects DoD priority to identify and scale specialized protection activities to combat strategic competitor illicit transfer of technology. | | | |
| **Accomplishments/Planned Programs Subtotals** | - | 5.592 | 7.157 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 6 | R-1 Program Element (Number/Name)<br>PE 0605797D8Z / *Maintaining Technology Advantage* | Project (Number/Name)<br>158 / *Program and Technology Protection* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 158: *Program and Technology Protection* | 0.000 | 0.000 | 5.000 | 6.354 | - | 6.354 | 6.480 | 6.361 | 4.996 | 5.097 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

The Department of Defense (DoD) must address cybersecurity and supply chain risks to DoD networks, weapons systems, and information stored and processed on both DoD and Defense Industrial Base (DIB) unclassified contractor information networks that support DoD programs. Increased reliance on the internet as a vehicle for sharing information, globalization of the supply chain, and advanced persistent threats (APTs) that can evade commercially available security tools and defeat generic security best practices, drives the need for diligent program protection planning and execution. Program Protection Planning includes protection of classified and unclassified controlled technical information, critical program information, critical components and critical mission functions, and integrates high level security policies and practical expertise to specific acquisition and S&T practices, systems engineering activities, and risk reduction activities. Through this initiative the Department is maturing system security engineering methodologies to protect controlled unclassified information, to include controlled technical information on contractor information networks; improve mitigation and management of supply chain risk management risks, improve integration of cybersecurity into the engineering processes, improve software assurance practices, mature processes to identify and protect Critical Program Information and improve program protection planning. Activities carried out, support implementation of DoD Instruction 5200.44 Trusted Systems and Networks with the use of proven mitigation techniques and tools, the ongoing refinement of risk management processes, and creation of needed technology; implementation of DoD Instruction 5200.39 Critical Program Information (CPI) Identification and Protection Within Research, Development, Test, and Evaluation (RDT&E) to identify and protect Critical Program Information; and implementation of DoD Instruction 8582.01 Security of Unclassified DoD Information on Non-DoD Information Systems for Safeguarding Controlled Unclassified Information on contractor owned networks.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Program and Technology Protection | - | 5.000 | 6.354 |
| ***Description:*** The project provides system security engineering policy, guidance and objective assessments to reduce risks in sharing and storing Controlled Technical Information, improve mitigation of supply chain risk management risks, improve integration of cybersecurity into the engineering processes, integrate defense exportability and anti-tamper practices, mature processes to identify Critical Program Information and improve program protection planning. Activities carried out support implementation of DoD Instruction 5200.44 Trusted Systems and Networks with the use of proven mitigation techniques and tools, the ongoing refinement of risk management processes; implementation of DoD Instruction 5200.39 Critical Program Information (CPI) Identification and Protection Within Research, Development, Test, and Evaluation (RDT&E) to identify and protect Critical Program Information; and implementation of DoD Instruction 8582.01 Security of Unclassified DoD Information on Non-DoD Information Systems for Safeguarding Controlled Unclassified Information on contractor owned networks. | | | |
| ***FY 2020 Plans:*** | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0605797D8Z / *Maintaining Technology Advantage* | **Project (Number/Name)**<br>158 / *Program and Technology Protection* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Provide support to Independent Technical Review Assessment and Cyber Vulnerability Review Assessment teams in conduct of broad program protection planning activities to assess:<br>- Conduct of criticality analyses to determine capability, systems and technology vulnerabilities.<br>- Conduct of Critical Program Information analysis to determine capability, systems and technology anti-tamper protections.<br>- Conduct Program Protection planning activities, and track progress to verify protection of capability, systems and technologies.<br>• Advance the state of the practice of systems security engineering:<br>- Continue development of methodology to identify and mitigate system security risk, to include cybersecurity and supply chain risk.<br>- Continue to develop courseware, refine guidance, provide training, and outreach with government and industry.<br>- Refine guidance, tools and mitigation approaches to mitigate capability, system and technology risks.<br>• Safeguard Controlled Unclassified Information, including Controlled Technical Information:<br>- Refine implementation and guidance of marking and dissemination of distribution of technical information.<br>- Refine safeguarding information protection methods for contractor unclassified information networks.<br>• Safeguard Critical Program Information:<br>- Refine implementation, guidance and tools to identify Critical Program Information.<br>- Develop and refine Anti-Tamper protections methods to safeguard Critical Program Information.<br>• Defense exportability features integration:<br>- Mature processes, methods and guidance for defense exportability features integration.<br>- Develop and refine defense exportability protection methods to improve planning for the exportability of U.S. Defense systems. | | | |
| ***FY 2021 Plans:***<br>Continue to:<br>Provide support to Independent Technical Review Assessment and Cyber Vulnerability Review Assessment teams in conduct of broad program protection planning activities to assess:<br>- Conduct of criticality analyses to determine capability, systems and technology vulnerabilities.<br>- Conduct of Critical Program Information analysis to determine capability, systems and technology anti-tamper protections.<br>- Conduct Program Protection planning activities, and track progress to verify protection of capability, systems and technologies.<br>• Advance the state of the practice of systems security engineering:<br>- Continue development of methodology to identify and mitigate system security risk, to include cybersecurity and supply chain risk.<br>- Continue to develop courseware, refine guidance, provide training, and outreach with government and industry.<br>- Refine guidance, tools and mitigation approaches to mitigate capability, system and technology risks.<br>• Safeguard Controlled Unclassified Information, including Controlled Technical Information:<br>- Refine implementation and guidance of marking and dissemination of distribution of technical information. | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0605797D8Z / *Maintaining Technology Advantage* | **Project (Number/Name)**<br>158 / *Program and Technology Protection* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| - Refine safeguarding information protection methods for contractor unclassified information networks.<br>• Safeguard Critical Program Information:<br>- Refine implementation, guidance and tools to identify Critical Program Information.<br>- Develop and refine Anti-Tamper protections methods to safeguard Critical Program Information.<br>• Defense exportability features integration:<br>- Mature processes, methods and guidance for defense exportability features integration.<br>- Develop and refine defense exportability protection methods to improve planning for the exportability of U.S. Defense systems.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Level of effort increase reflects DoD priority to identify Cyber resiliency standards to engineer secure, resilient, survivable weapon systems in response to contested cyberspace and to conduct ITRA Program Protection/Cyber assessments. | | | |
| **Accomplishments/Planned Programs Subtotals** | - | 5.000 | 6.354 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 6 | R-1 Program Element (Number/Name)<br>PE 0605797D8Z / *Maintaining Technology Advantage* | Project (Number/Name)<br>043 / *Technology Innovation Base* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 043: *Technology Innovation Base* | 0.000 | 0.000 | 0.000 | 6.710 | - | 6.710 | 8.164 | 8.613 | 10.000 | 10.000 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

The Technology Innovation Base (TIB) effort develops long-term strategies and employs mechanisms to retain the U.S. advantage in current and emerging modernization technology priorities and the innovation base developing, testing, manufacturing, and sustaining them. This project provides support to technology priority leaders in identifying innovation base needs; characterizing and assessing priority technology areas, identifying and mitigating risks impacting the innovation base, and exploiting opportunities to advance technology development, testing, and manufacturing. One of TIB's main objectives is to create balance between promotion of the innovation base while protecting the technology from interference or exploitation by competitors.. This balance will aid the Department's advancing critical and emergent technologies ahead of competitor nations and actors while sustaining a healthy, resilient, and globally competitive innovation base. This portfolio of activity extends efforts initiated in response to FY19 NDAA Section 1793.

This project uses a three-step approach: (1) Assess, (2) Protect/Promote; and (3) Monitor. In the first step, TIB uses emerging technology assessments to translate technology requirements to manufacturing and innovation base requirements in order to identify innovation base issues, risks, and opportunities. TIB created an assessment methodology that incorporates four types of studies to provide a full overview of the technology from a manufacturing and innovation base point of view. The results of the assessments are used to create technology and innovation base protection and promotion strategies (second step of the approach). TIB leverages DoD and Federal Government tools and initiatives to implement the strategies. In the third step, TIB uses data analytics to measure the success of mitigation and exploitation strategies, establish trends in the markets, and identify the need for additional assessments or changes in the strategies. For technology protection, TIB manages the OUSD(R&E) responsibilities for the Committee on Foreign Investment in the United States (CFIUS) reviews. TIB does the initial screening of all CFIUS cases to determine R&E equities and request R&E subject matter experts review in foreign acquisition transactions with a potential negative impact to national security. TIB is the focal point for all R&E stakeholders and the link between the organization and the rest of the DoD stakeholders.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Technology Innovation Base | - | - | 6.710 |
| ***FY 2021 Plans:***<br>• Create and implement short-term and long-term strategies to protect and maintain U.S. technology advantage by growing and retaining critical technologies and the innovation base supporting their development, test, manufacturing, and sustainment.<br>• Assess, promote, protect, and monitor critical technologies and their supply chain.<br>• Manage technology innovation base assessments performed by other DoD and USG Agencies, Federally Funded Research and Development Centers (FFRDCs), University Affiliated Research Center (UARCs), or industry. | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0605797D8Z / *Maintaining Technology Advantage* | **Project (Number/Name)**<br>043 / *Technology Innovation Base* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| • Conduct deep dive studies to identify and address national security innovation base risks,issues, and opportunities related to DoDto include but not limited to:<br>- Tools, technologies or techniques associated with development, testing, or manufacturing<br>- Financial health of key industrial partners and suppliers<br>- Workforce need for scientists, engineers, technicians<br>- Sensitivies to single source materials, critical pockets of expertise, impacts to environmental events, exploitation by foreign actors to secure or deter critical elements of the innovation base<br>• Manage R&E Committee on Foreign Investment in U.S. transaction reviews.<br>• Monitor the defense innovation base and the performance of the protect/promote activities.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>FY 2021 increase reflects DoD priority to identify and address new, emerging manufacturing capabilities and technology base gaps that are critical to fielding modernization priorities, including workforce, engineering and prototyping infrastructure and facilities. | | | |
| **Accomplishments/Planned Programs Subtotals** | - | - | 6.710 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support* | **R-1 Program Element (Number/Name)**<br>PE 0605798D8Z / *Defense Technology Analysis* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 0.000 | 27.231 | 15.875 | 29.059 | - | 29.059 | 28.185 | 28.402 | 28.750 | 29.081 | Continuing | Continuing |
| 796: *Laboratory Resource Management* | 0.000 | 6.110 | 8.445 | 5.355 | - | 5.355 | 4.748 | 4.811 | 4.915 | 5.015 | Continuing | Continuing |
| 797: *Defense Technology Analysis* | 0.000 | 5.487 | 5.947 | 11.000 | - | 11.000 | 11.000 | 11.500 | 11.500 | 11.500 | Continuing | Continuing |
| 798: *Defense Support Teams* | 0.000 | 1.768 | 1.483 | 9.204 | - | 9.204 | 8.937 | 9.091 | 9.335 | 9.566 | Continuing | Continuing |
| 728: *Homeland Defense Capability Development Initiatives* | 0.000 | 0.000 | 0.000 | 3.500 | - | 3.500 | 3.500 | 3.000 | 3.000 | 3.000 | Continuing | Continuing |
| 102: *Data Vulnerability Assessment and Analysis* | 0.000 | 13.866 | 0.000 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

**Note**

In FY 2020, Project 102 funding is realigned to PE 0605797D8Z.

**A. Mission Description and Budget Item Justification**

The Under Secretary of Defense for Research and Engineering (USD(R&E)) is the principal staff advisor to the Secretary and Deputy Secretary of Defense, responsible for the research, development, and prototyping activities across the DoD enterprise. In this capacity, OUSD(R&E) conducts analyses and studies; develops policies; provides technical leadership, oversight and advice; and issues guidance for Department of Defense (DoD) RDT&E programs. This program element (PE) provides mission support to the Office of the USD(R&E) (OUSD(R&E)) covering a wide range of studies and analysis in support of the R&E program and its impacts to the Department's decision to fund Research, Development, Test and Evaluation (RDT&E) efforts. Such activities include: (1) identification and development of new technological opportunities; (2) insertion of new technologies into warfighting systems and operations; and (3) management and evaluation of the effectiveness of technology programs.

The PE provides funding for the Defense Laboratory Office within the USD(R&E). The Defense Laboratory Office mission is to craft policy and provide the oversight necessary to both preserve current and develop future DoD in-house laboratory capability such that they continue to generate mission-critical innovations that increase the U.S. military advantage and enhance U.S. national security. The Defense Laboratory Office advocates and supports the DoD laboratory system in three areas: (1) facilities and infrastructure; (2) personnel and quality of workforce; and (3) technology transfer.

The PE provides funding for engineering, scientific, and analytical support to the USD(R&E) in its responsibility for direction, overall quality, and content of the science and technology (S&T) program and to ensure that the technology being developed is affordable and helps minimize system development risk.

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support* | **R-1 Program Element (Number/Name)**<br>PE 0605798D8Z / *Defense Technology Analysis* |

Beginning in FY 2021, the PE will also fund research and technical analysis and management, under the direction of the newly created Director of Defense Research and Engineering for Modernization. These investments will promote further prioritization and targeting of the Department's key investments across the modernization efforts.

Beginning in FY 2021, this PE will also fund Homeland Defense Capabilities Development Initiatives to address technology application in support of homeland defense of our military installations and the surrounding areas.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 27.425 | 16.875 | 16.721 | - | 16.721 |
| Current President's Budget | 27.231 | 15.875 | 29.059 | - | 29.059 |
| Total Adjustments | -0.194 | -1.000 | 12.338 | - | 12.338 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | -4.000 | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | 3.000 | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | 0.649 | - | | | |
| • SBIR/STTR Transfer | -0.838 | - | | | |
| • Other Adjustments | -0.005 | - | -0.139 | - | -0.139 |
| • Economic Assumption | - | - | -0.023 | - | -0.023 |
| • Adjustment to support Modernization priorities | - | - | 11.000 | - | 11.000 |
| • Adjustment for Counter Unmanned Aircraft Systems | - | - | 1.500 | - | 1.500 |

| Congressional Add Details ($ in Millions, and Includes General Reductions) | FY 2019 | FY 2020 |
|---|---|---|
| **Project:** 796: *Laboratory Resource Management* | | |
| Congressional Add: *Program Increase - Defense Technology Transfer* | 2.992 | 3.000 |
| Congressional Add Subtotals for Project: 796 | 2.992 | 3.000 |
| Congressional Add Totals for all Projects | 2.992 | 3.000 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 6 | R-1 Program Element (Number/Name)<br>PE 0605798D8Z / *Defense Technology Analysis* | Project (Number/Name)<br>796 / *Laboratory Resource Management* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 796: *Laboratory Resource Management* | 0.000 | 6.110 | 8.445 | 5.355 | - | 5.355 | 4.748 | 4.811 | 4.915 | 5.015 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

The Defense Laboratory Office (DLO) provides advocacy, strategic planning, and policy for the DoD's in-house laboratories. The DoD Laboratory Enterprise consists of more than 60 laboratories with approximately 67,000 employees (approximately 50,000 of whom are scientists and engineers). The Defense Laboratory Office develops plans and investment strategies for laboratory infrastructure, technology transfer programs, and personnel development. Section 211 of the FY 2017 National Defense Authorization Act (NDAA) also transferred the management of the laboratory demonstration program at Science and Technology Reinvention Laboratories (STRLs) from the Under Secretary of Defense for Personnel and Readiness (USD(P&R)) to the Assistant Secretary of Defense for Research and Engineering (ASD(R&E)). Section 218 of the FY 2018 NDAA amended the authority by redesignating management to the Under Secretary of Defense for Research and Engineering (USD(R&E)).

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Defense Laboratory Office | 3.118 | 5.445 | 5.355 |
| ***Description:*** Provides advocacy, strategic planning, and policy for the DoD's in-house laboratories. Develops plans and investment strategies for laboratory infrastructure, technology programs, and personnel development.<br><br>***FY 2020 Plans:***<br>• The DLO will continue to develop plans, policies and investment strategies for laboratory infrastructure, technology transfer programs, personnel development, and the Laboratory Quality Enhancement Program Panels that supports the in-house Defense Laboratory Enterprise.<br>• The DLO will develop an advanced technical training pilot program to efficiently and effectively provide insight on technology transfer from DoD laboratories to the market. Future initiatives will look at developing a single intellectual property (IP) docketing and tracking system across DoD that will enable real time tracking of the DoD IP portfolio.<br>***FY 2021 Plans:***<br>• The DLO will continue to develop plans, policies and investment strategies for laboratory infrastructure, technology transfer programs, personnel development, and the Laboratory Quality Enhancement Program Panels that supports the in-house Defense Laboratory Enterprise.<br>• The DLO will develop an advanced technical training pilot program to efficiently and effectively provide insight on technology transfer from DoD laboratories to the market. Future initiatives will look at developing a single intellectual property (IP) docketing and tracking system across DoD that will enable real time tracking of the DoD IP portfolio.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:*** | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0605798D8Z / *Defense Technology Analysis* | **Project (Number/Name)**<br>796 / *Laboratory Resource Management* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| The level of effort is consistent between FY 2020 and FY 2021. Small changes reflect minor budget fluctuations. | | | |
| **Accomplishments/Planned Programs Subtotals** | 3.118 | 5.445 | 5.355 |

| | FY 2019 | FY 2020 |
|---|---|---|
| ***Congressional Add:*** Program Increase - Defense Technology Transfer | 2.992 | 3.000 |
| ***FY 2019 Accomplishments:*** • Initiated innovative technology transfer pilot programs.<br>• Produced engagement tools to highlight mechanisms and enable greater technology transfer to the defense industrial base, non traditional performers and other private sector entities.<br>***FY 2020 Plans:*** • Continue innovative technology transfer pilot programs. | | |
| **Congressional Adds Subtotals** | 2.992 | 3.000 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 6 | R-1 Program Element (Number/Name)<br>PE 0605798D8Z / *Defense Technology Analysis* | Project (Number/Name)<br>797 / *Defense Technology Analysis* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 797: *Defense Technology Analysis* | 0.000 | 5.487 | 5.947 | 11.000 | - | 11.000 | 11.000 | 11.500 | 11.500 | 11.500 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

The Defense Technology Analysis (DTA) project funds engineering, scientific, and analytical support for the Office of the Under Secretary of Defense for Research and Engineering (OUSD(R&E)) and specifically the office of the Director of Defense Research and Engineering for Modernization (DDR&E(Modernization)) starting in FY 2021. The DDR&E(Modernization) supports the USD(R&E) by prioritizing the National Defense Strategy modernization lines of effort in order to maintain competitive advantage against adversaries. The efforts funded in this project code are critical to establish roadmaps in modernization areas that ultimately support the technical advantage of the Warfighter.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Defense Technology Analysis | 5.487 | 5.947 | 11.000 |
| ***Description:*** The DDR&E(Modernization) has oversight of the National Defense Strategy modernization priorities. The eleven modernization priorities are: 5G; Artificial Intelligence/Machine Learning; Cyber; Biotechnology; Directed Energy; Space; Quantum Science; Hypersonics; Autonomy; Fully Networked Command, Control, and Communication; and Microelectronics. Identifying leading edge technology in these areas to maintain superiority is critical to the warfighting efforts of the U.S. military. Funding for research, technical analysis and management, and other advanced research methods will allow for success in identifying the key investments in the Department's modernization efforts. | | | |
| ***FY 2020 Plans:***<br>Continue to provide engineering, scientific, analytical, and managerial support to the OUSD(R&E) to develop strategies, plans, and policies to develop and exploit technology; conduct technology analyses; make recommendations and develop guidance for RDT&E plans and programs in Modernization priority areas; review acquisition programs and make recommendations to optimize effectiveness of the DoD investments; and oversee RDT&E issues and initiatives and respond to Congressional special interests in the OUSD(R&E) portfolio areas. | | | |
| ***FY 2021 Plans:***<br>Advance and update modernization roadmaps to reflect emerging trends in the modernization field. Continue analysis in defense modernization efforts while coordinating with Service leads to identify Military Department specific needs. | | | |
| ***FY 2020 to FY 2021 Increase/Decrease Statement:*** | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0605798D8Z / *Defense Technology Analysis* | **Project (Number/Name)**<br>797 / *Defense Technology Analysis* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| The increase in FY 2021 supports efforts under the office of the DDR&E(Modernization). | | | |
| **Accomplishments/Planned Programs Subtotals** | 5.487 | 5.947 | 11.000 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 6 | R-1 Program Element (Number/Name)<br>PE 0605798D8Z / *Defense Technology Analysis* | Project (Number/Name)<br>798 / *Defense Support Teams* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 798: *Defense Support Teams* | 0.000 | 1.768 | 1.483 | 9.204 | - | 9.204 | 8.937 | 9.091 | 9.335 | 9.566 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**Note**

In FY 2021, funding re-aligned from Project Code 797 to accurately reflect support to mission.

**A. Mission Description and Budget Item Justification**

The Department's key expertise for reviewing and guiding research and engineering (R&E) programs resides in the Office of the Under Secretary of Defense for Research and Engineering (OUSD(R&E)). The OUSD(R&E) staff augment their responsibilities through connections to technology experts in various fields throughout academia, industry, and government.

In FY 2021, efforts from Project Code 797, Defense Technology Analysis, will be aligned to this project code to continue to provide engineering, scientific, and analytical support to the Office of the Under Secretary of Defense for Research and Engineering (OUSD(R&E)) in its responsibility for direction, overall quality, and content of the science and technology (S&T) program. This activity conducts assessments and analyses to ensure maximum utilization of research and development funds to accomplish the overall objectives of the S&T program and that the technology being developed is affordable and minimizes system development risk. Funds are required for technical, analytical, management support, travel, and publications.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Defense Support Teams | 1.768 | 1.483 | 9.204 |
| ***Description:*** This project provides engineering, scientific, and analytical support to the OUSD(R&E) in its responsibility for direction, overall quality, and content of the S&T program. Furthermore, it ensures that the technology being developed is affordable and minimizes system development risk. | | | |
| ***FY 2020 Plans:***<br>In FY 2020, continue to establish support teams and conduct technology analyses to support R&E program investment decisions. For selected acquisition programs and efforts, reviewed in technical detail the respective program issues and offered technical solutions to program managers. Assessed the maturity of technologies that were candidates for transition to acquisition programs. | | | |
| ***FY 2021 Plans:***<br>In FY 2021, this project will provide engineering, scientific, analytical, and managerial support to the OUSD(R&E) in developing strategies, plans, and policies to develop and exploit technology; conducting technology analyses, making recommendations, and developing guidance for S&T plans and programs; reviewing acquisition programs and making recommendations to optimize | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0605798D8Z / *Defense Technology Analysis* | **Project (Number/Name)**<br>798 / *Defense Support Teams* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| effectiveness of the DoD investments; and oversight of S&T issues and initiatives and responding to Congressional special interests.<br><br>The program will also conduct technology analyses to support R&E program investment decisions. For selected acquisition programs and efforts, respective program issues will be reviewed and technical solutions will be offered to program managers. The maturity of technologies that are candidates for transition to acquisition programs will also be assessed.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>In FY 2021, efforts from Project Code 797, Defense Technology Analysis, are re-aligned to this Project Code to provide engineering, scientific, and analytical support to the OUSD(R&E) in its responsibility for direction, overall quality, and content of the S&T program. | | | |
| **Accomplishments/Planned Programs Subtotals** | 1.768 | 1.483 | 9.204 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 6 | R-1 Program Element (Number/Name)<br>PE 0605798D8Z / *Defense Technology Analysis* | Project (Number/Name)<br>728 / *Homeland Defense Capability Development Initiatives* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 728: *Homeland Defense Capability Development Initiatives* | 0.000 | 0.000 | 0.000 | 3.500 | - | 3.500 | 3.500 | 3.000 | 3.000 | 3.000 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**Note**

FY 2021 funding re-aligned from Project Code 797 to establish new Pcode in support of Homeland Defense Capability Development efforts.

**A. Mission Description and Budget Item Justification**

Homeland Defense Capability Development (HDCD) uniquely engages with the Services, Combatant Commands, and our Federal partners on critical Science and Technology (S&T) and Research, Development, Test and Evaluation (RDT&E) initiatives to address technology application in support of homeland defense of our military installations and the surrounding areas. Key technology applications complement the Office of the Under Secretary of Defense for Research and Engineering's modernization priorities: Fully Networked Command, Control, and Communications; Directed Energy, Cyber, Autonomy, and Machine Learning/Artificial Intelligence. HDCD remains engaged on current and future initiatives in order to advance the "Homeland Defense Layer" identified in the National Defense Strategy (NDS).

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Homeland Defense Capability Development Initiatives | - | - | 3.500 |
| ***FY 2021 Plans:***<br>Provide S&T and RDT&E support from FY 2020 Cruise Missile Defense (CMD)/Homeland Defense Design, Humanitarian Assistance/Disaster Relief (HADR) Enabling Commercial Technologies, and Sustainable Microgrid Technologies to Defend Key Locations/Assets against Powergrid Attacks efforts.<br><br>Support analysis to include the discrimination of 5G-enabled autonomous threats, interagency Unmanned Aircraft Systems (UAS) technology projects, defense against autonomous systems, and defense against projected homeland air threats. These plans support the NDS global trends on technology. | | | |
| ***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>New project code established in FY 2021 to support Homeland Defense Capability Development Initiatives; efforts previously funded under Project Code 797. | | | |
| **Accomplishments/Planned Programs Subtotals** | - | - | 3.500 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0605798D8Z / *Defense Technology Analysis* | **Project (Number/Name)**<br>728 / *Homeland Defense Capability Development Initiatives* |

**C. Other Program Funding Summary ($ in Millions)**

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 6 | R-1 Program Element (Number/Name)<br>PE 0605798D8Z / *Defense Technology Analysis* | Project (Number/Name)<br>102 / *Data Vulnerability Assessment and Analysis* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 102: *Data Vulnerability Assessment and Analysis* | 0.000 | 13.866 | 0.000 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**Note**

In FY 2020, this funding is transferred to the Maintaining Technology Advantage PE 0605797D8Z, in accordance with the new OUSD(R&E) re-organization.

**A. Mission Description and Budget Item Justification**

Most DoD technical information resides on unclassified networks where it is at risk of being targeted for cyber espionage campaigns. Protecting DoD unclassified controlled technical information is a high priority for the Department, and is critical to preserving intellectual property and competitive capabilities of our national industrial base. To maintain full confidence in our systems, the Department must also assess the effect the loss of this information has on our warfighting capabilities. DoD contractors who produce or access controlled technical information must incorporate security standards on their networks and report cyber-intrusion incidents that result in the loss of this information. These requirements are important, but insufficient in the face of a determined adversary. The Department must take steps to understand the impacts of losses and rethink how we safeguard our capabilities. This information, while unclassified, includes data and intellectual property concerning defense systems requirements, concepts of operations, technologies, designs, engineering, systems production, and component manufacturing.

This project supports protection of unclassified controlled technical information, and an analysis of losses, to determine consequences and appropriate requirements, acquisition, programmatic, and strategic courses of action.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Data Vulnerability Program<br>***Description:*** The Data Vulnerability Assessment and Analysis project will establish a joint analysis capability to conduct comprehensive assessments of controlled unclassified technical information losses, and will engage acquisition and intelligence sources, to determine consequences and appropriate preventative/mitigation actions. | 13.866 | - | - |
| **Accomplishments/Planned Programs Subtotals** | 13.866 | - | - |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support* | **R-1 Program Element (Number/Name)**<br>PE 0605804D8Z / *Development Test & Evaluation* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 98.912 | 19.417 | 22.203 | 27.198 | - | 27.198 | 27.634 | 25.999 | 26.536 | 26.971 | Continuing | Continuing |
| 804: *Development Test & Evaluation* | 98.912 | 19.417 | 22.203 | 20.198 | - | 20.198 | 20.634 | 18.999 | 19.536 | 19.971 | Continuing | Continuing |
| 048: *Cybersecurity DT&E for Weapon Systems* | - | 0.000 | 0.000 | 7.000 | - | 7.000 | 7.000 | 7.000 | 7.000 | 7.000 | Continuing | Continuing |

**Note**

In FY 2021, OSD(R&E) added the Cybersecurity DT&E for Weapon Systems project (Project Code 048) to provide needed Cybersecurity test strategies/plans to the acquisition/development process.

**A. Mission Description and Budget Item Justification**

Program Element (PE) 0605804D8Z establishes the dedicated funding line to carry out the duties in accordance with Title 10 U.S.C. Section 133a, FY 2018 National Defense Authorization Act (NDAA) section 838, and Department of Defense Instruction (DoDI) 5000.02 Change 4 dated August 31, 2018. Specific responsibilities are outlined in DoDI 5134.17 Change 3 dated October 15, 2018. The Director, Developmental Test and Evaluation (DT&E) is the principal advisor to the Secretary of Defense; the Under Secretary of Defense, Research and Engineering (USD(R&E)); and the Under Secretary of Defense, Acquisition and Sustainment (USD(A&S)) on Development Test and Evaluation (DT&E) in the Department of Defense (DoD).

Program Element 0605804D8Z supports the three strategic lines of effort within the National Defense Strategy (NDS). The Office of the USD(R&E) (OUSD(R&E) engages with acquisition and rapid prototype programs to provide test planning expertise, including cybersecurity DT&E, and decision-quality data at major program reviews to help them succeed in modernizing key capabilities to Build a More Lethal Force. OUSD(R&E) serves as the T&E acquisition career field Functional Leader to enhance the experience and qualification of the 8,700+ member DoD T&E workforce to Cultivate Workforce Talent and support priority emerging technologies. OUSD(R&E) ensures programs meet interoperability requirements to deepen interoperability and Strengthen Alliances. The PE also works to streamline T&E policy and guidance to improve test efficiency, and reduce acquisition cost and schedule to Reform the Department for Greater Performance and Affordability.

Program Element (PE) 0605804D8Z supports and improves the DT&E efforts of Major Defense Acquisition Program (MDAP), Major Automated Information System (MAIS) / Priority Defense Business Systems, Rapid Prototyping/Fielding efforts, and other Special Interest (SI) acquisition programs designated by USD(R&E) or USD(A&S) as they progress through the acquisition/development lifecycle; lead the defense acquisition workforce Test and Evaluation (T&E) career field; and support development of policy and guidance for the conduct of DT&E within the DoD. Beginning in FY 2021, OUSD(R&E) established project 048, “Cybersecurity DT&E for Weapon Systems”, to provide dedicated resources to support MDAP and Rapid Prototyping/Fielding Program Managers, Chief Developmental Testers, and Lead DT&E Organizations in the development of comprehensive, efficient, and innovative Cybersecurity DT&E strategies/plans to support key acquisition milestones and engineering/programmatic decisions.

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support* | **R-1 Program Element (Number/Name)**<br>PE 0605804D8Z / *Development Test & Evaluation* |

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 20.133 | 22.203 | 22.248 | - | 22.248 |
| Current President's Budget | 19.417 | 22.203 | 27.198 | - | 27.198 |
| Total Adjustments | -0.716 | 0.000 | 4.950 | - | 4.950 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | -0.713 | - | | | |
| • Transfer to PE 0605142D8Z | - | - | -1.850 | - | -1.850 |
| • Other Adjustments and DoD priorities | -0.003 | - | -0.180 | - | -0.180 |
| • Economic Assumption | - | - | -0.020 | - | -0.020 |
| • Cybersecurity DT&E for Weapon Systems | - | - | 7.000 | - | 7.000 |

**Change Summary Explanation**

The $4.949 million adjustment in FY 2021 is the net of a $1.850 million transfer of the DT&E Engineering Policy effort to Program Element 0605142D8Z (Systems Engineering) for proper alignment and execution, a $7.000 million increase for Cybersecurity DT&E for Weapon Systems security strategies/plans, and a $0.201 million reduction for economic assumptions and other DoD priorities.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 6 | R-1 Program Element (Number/Name)<br>PE 0605804D8Z / *Development Test & Evaluation* | Project (Number/Name)<br>804 / *Development Test & Evaluation* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 804: *Development Test & Evaluation* | 98.912 | 19.417 | 22.203 | 20.198 | - | 20.198 | 20.634 | 18.999 | 19.536 | 19.971 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

This project provides resources to support MDAP and Rapid Prototyping/Fielding Program Managers, Chief Developmental Testers, and Lead DT&E Organizations in the development of comprehensive, efficient, and innovative DT&E strategies/plans to support key acquisition milestones and engineering/programmatic decisions. This project also supports the OUSD(R&E) to manage the Test & Evaluation (T&E) career field and curriculum for the DoD acquisition workforce, and develop policy and guidance for the conduct of DT&E within DoD. On behalf of the OUSD(R&E) this project executes the following activities:

- Support acquisition programs in the development of comprehensive, efficient, and innovative test strategies. Ensure that developmental test strategies are documented in Test and Evaluation Master Plans (TEMPs). Review and approve/disapprove the DT&E strategy/plans within the TEMP.
- Support rapid prototyping, rapid fielding, and technology demonstrations efforts in the development of tailored comprehensive, efficient, and innovative DT&E strategies/plans.
- Review and oversee developmental test processes across the services, especially during the formative stages of programs, to include prototyping and experimentation.
- Provide DT&E subject matter experts to assist programs in building Developmental Evaluation Frameworks (DEFs) for inclusion in the TEMP.
- Provide cybersecurity subject matter experts and assist programs in conducting Cybersecurity Table Top Exercises to identify potential threat vectors and associated risks early in development and focus Cybersecurity DT&E efforts (In FY 2021, this effort will move to Project 048).
- For ACAT ID programs, provide independent DT&E Sufficiency Assessments prior to Milestone B and C decisions with the goal of reducing discovery of performance issues later in the acquisition cycle.
- When requested by the Secretary or Deputy Secretary of Defense, provide independent developmental test assessments in support of USD(A&S) and Service Major Defense Acquisition Programs.
- Support the development of independent technical risk assessments and advise the Secretary on the progress toward meeting Key Performance Parameters, technology maturation, reliability growth projections, interoperability, and cybersecurity posture before any decision to grant Milestone A or B approval, or enter into low-rate initial production or full-rate production for ACAT ID programs or when requested by the Secretary.
- Serve as the Functional Leader for the T&E acquisition career field. Support OUSD(R&E) to establish, oversee, and maintain the education, training, and experience requirements including competencies and certification standards to enhance the T&E acquisition workforce. Monitor and facilitate Defense Acquisition University (DAU) updates of T&E courses to ensure the curriculum supports the certification standards and provides the appropriate education and training.
- Manage the Scientific Test and Analysis Techniques Center of Excellence (STAT COE). Over the last four years, the STAT COE has supported over 40 Acquisition Program Managers in the development of statistically optimized test programs. These efforts have resulted in 175 more efficient and effective test plans and a test cost avoidance of about $160.000 million.
- Support OUSD(R&E) to develop policy and guidance that ensures efficient and effective DT&E across the DoD, including policy and guidance for developmental testing of interoperability and cybersecurity in coordination with the Joint Staff and DoD Chief Information Officer (CIO).

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0605804D8Z / *Development Test & Evaluation* | **Project (Number/Name)**<br>804 / *Development Test & Evaluation* |

- Identify DoD test infrastructure gaps and support development of the OUSD(R&E) test resources strategic plan.
- Ensure that the DT&E activities are fully integrated into, and consistent with, the DoD Systems Engineering and development planning processes.
- Evolve the DT&E 'state of practice' to keep pace with emerging technologies and improve test efficiency to field systems faster.
- Coordinate with Director, Operational Test and Evaluation to improve T&E efficiency and make best use of integrated testing.
- Beginning in FY 2021, Cybersecurity efforts in this project will be moved to project 048.
- Beginning in FY 2021, USD(R&E) consolidated all policy and workforce efforts under the SE Program Element 0605142D8Z. T&E Policy and Workforce efforts will be managed and funded from that PE with support from this PE.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Development Test and Evaluation | 19.417 | 22.203 | 20.198 |
| ***Description:*** This program supports and improves the DT&E efforts of Major Defense Acquisition Program (MDAP), Major Automated Information System (MAIS) / Priority Defense Business Systems, Rapid Prototyping/Fielding efforts, and other Special Interest (SI) acquisition programs as they progress through the acquisition/development lifecycle; lead the defense acquisition workforce T&E career field; and support development of policy and guidance for the conduct of DT&E within the DoD. | | | |
| ***FY 2020 Plans:***<br>- Work with Acquisition Program Managers, Chief Developmental Testers, and Lead DT&E organizations to improve DT&E planning and develop comprehensive and efficient DT&E strategies/plans through the use of disciplined Developmental Evaluation Framework Matrices and Scientific Test and Analysis Techniques (STAT).<br>- Continue to support rapid prototyping, rapid fielding, and technology demonstrations efforts in the development of tailored comprehensive, efficient, and innovative DT&E strategies/plans.<br>- Continue to implement the OUSD(R&E) 'Shift Left' initiative that focuses on ensuring DT&E strategies/plans are developed in advance of releasing Technology Maturation and Risk Reduction (TMRR) and Engineering and Manufacturing Development (EMD) Request For Proposals (RFPs), and increasing the amount and quality of data available to support production decisions with specific focus on cybersecurity, interoperability, and reliability.<br>- Review/approve all TEMPs submitted to support milestone reviews. Ensure DT&E planning is complete prior to the start of DT&E activities.<br>- Refine DT&E policies and methodologies addressing DT&E across all Acquisition programs.<br>- For ACAT ID programs, publish independent DT&E Sufficiency Assessments prior to Milestone B and C decisions with the goal of reducing discovery of performance issues later in the acquisition cycle.<br>- When requested by the Secretary or Deputy Secretary of Defense, provide independent developmental test assessments in support of USD(A&S) and Service Major Defense Acquisition Programs.<br>- Promote the application of sound DT&E and related technical disciplines across the Department's acquisition community and programs.<br>- Serve as Functional Leader of the T&E acquisition workforce. | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0605804D8Z / *Development Test & Evaluation* | **Project (Number/Name)**<br>804 / *Development Test & Evaluation* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| - Review the DAU T&E education, training, and experience requirements including competencies and certification standards; position category description(s); and content of the DAU courses. Provide direction on needed changes.<br>- Develop implementation plan to evolve the DT&E 'state of practice' to keep pace with emerging technologies and improve test efficiency to field systems faster.<br>***FY 2021 Plans:***<br>- Work with Acquisition Program Managers, Chief Developmental Testers, and Lead DT&E organizations to improve DT&E planning and develop comprehensive and efficient DT&E strategies/plans through the use of disciplined Developmental Evaluation Framework Matrices and Scientific Test and Analysis Techniques (STAT).<br>- Continue to support rapid prototyping, rapid fielding, and technology demonstrations efforts in the development of tailored comprehensive, efficient, and innovative DT&E strategies/plans.<br>- Continue to implement the OUSD(R&E) 'Shift Left' initiative that focuses on ensuring DT&E strategies/plans are developed in advance of releasing Technology Maturation and Risk Reduction (TMRR) and Engineering and Manufacturing Development (EMD) RFPs, and increasing the amount and quality of data available to support production decisions with specific focus on cybersecurity, interoperability, and reliability.<br>- Review/approve all TEMPs submitted to support milestone reviews. Ensure DT&E planning is complete prior to the start of DT&E activities.<br>- Refine DT&E policies and methodologies addressing DT&E across all Acquisition programs.<br>- For ACAT ID programs, publish independent DT&E Sufficiency Assessments prior to Milestone B and C decisions with the goal of reducing discovery of performance issues later in the acquisition cycle.<br>- When requested by the Secretary or Deputy Secretary of Defense, provide independent developmental test assessments in support of USD(A&S) and Service Major Defense Acquisition Programs.<br>- Promote the application of sound DT&E and related technical disciplines across the Department's acquisition community and programs.<br>- Serve as Functional Leader of the T&E acquisition workforce.<br>- Review the DAU T&E education, training, and experience requirements including competencies and certification standards; position category description(s); and content of the DAU courses. Provide direction on needed changes.<br>- Implement initiatives that evolve the DT&E 'state of practice' to keep pace with emerging technologies and improve test efficiency to field systems faster.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Realignment of program priorities. | | | |
| **Accomplishments/Planned Programs Subtotals** | 19.417 | 22.203 | 20.198 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0605804D8Z / *Development Test & Evaluation* | **Project (Number/Name)**<br>804 / *Development Test & Evaluation* |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

N/A

**D. Acquisition Strategy**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 6 | R-1 Program Element (Number/Name)<br>PE 0605804D8Z / *Development Test & Evaluation* | Project (Number/Name)<br>048 / *Cybersecurity DT&E for Weapon Systems* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 048: *Cybersecurity DT&E for Weapon Systems* | - | 0.000 | 0.000 | 7.000 | - | 7.000 | 7.000 | 7.000 | 7.000 | 7.000 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

Beginning in FY 2021, this project will provide dedicated resources to support MDAP and Rapid Prototyping/Fielding Program Managers, Chief Developmental Testers, and Lead DT&E Organizations in the development of comprehensive, efficient, and innovative Cybersecurity DT&E strategies/plans to support key acquisition milestones and engineering/programmatic decisions. On behalf of the OUSD(R&E) this project executes the following activities:

- Support acquisition programs in the development of comprehensive, efficient, and innovative Cybersecurity DT&E strategies. Ensure that Cybersecurity DT&E strategies are documented in Test and Evaluation Master Plans (TEMPs). Review and approve/disapprove the Cybersecurity DT&E strategy/plans within the TEMP.
- Support rapid prototyping, rapid fielding, and technology demonstrations efforts in the development of tailored comprehensive, efficient, and innovative Cybersecurity DT&E strategies/plans.
- Review and oversee Cybersecurity DT&E processes across the services, especially during the formative stages of programs, to include prototyping and experimentation.
- Provide Cybersecurity DT&E subject matter experts to assist programs in building Developmental Evaluation Frameworks (DEFs) for inclusion in the TEMP.
- Provide Cybersecurity subject matter experts and assist programs in conducting Cybersecurity Table Top Exercises to identify potential threat vectors and associated risks early in development and focus Cybersecurity DT&E efforts.
- Provide Cybersecurity subject matter experts to assist programs with Phases 1 and 2 of the DoD Cybersecurity T&E Process and to develop Cybersecurity DT&E test objectives aligned to Cybersecurity requirements for security standards, cyber survivability and operational resilience.
- Support the development of independent technical risk assessments and advise the Secretary on the Cybersecurity, cyber survivability, and resilience posture before any decision to grant Milestone A or B approval, or enter into low-rate initial production or full-rate production for ACAT ID programs or when requested by the Secretary.
- Support OUSD(R&E) to develop Cybersecurity policy and guidance that ensures efficient and effective Cybersecurity DT&E across the DoD and in coordination with the Joint Staff and DoD Chief Information Officer (CIO).
- Identify DoD Cybersecurity test infrastructure gaps and support development of the OUSD(R&E) test resources strategic plan.
- Ensure that the Cybersecurity DT&E activities are fully integrated into, and consistent with, the DoD Systems Engineering and development planning processes.
- Evolve the Cybersecurity DT&E 'state of practice' to keep pace with emerging technologies and improve test efficiency to field systems faster.
- Coordinate with Director, Operational Test and Evaluation to improve Cybersecurity T&E efficiency and make best use of integrated testing.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Cybersecurity DT&E for Weapon Systems | 0.000 | 0.000 | 7.000 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0605804D8Z / *Development Test & Evaluation* | **Project (Number/Name)**<br>048 / *Cybersecurity DT&E for Weapon Systems* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Description:*** Beginning in FY2021, This program supports and improves the Cybersecurity DT&E efforts of Major Defense Acquisition Program (MDAP), Major Automated Information System (MAIS) / Priority Defense Business Systems, Rapid Prototyping/Fielding efforts, and other Special Interest (SI) acquisition programs as they progress through the acquisition/ development lifecycle; and support development of policy and guidance for the conduct of Cybersecurity DT&E within the DoD.<br><br>***FY 2020 Plans:***<br>N/A.<br><br>***FY 2021 Plans:***<br>- Work with Acquisition Program Managers, Chief Developmental Testers, and Lead DT&E organizations to improve Cybersecurity DT&E planning and develop comprehensive and efficient DT&E strategies/plans through the use of disciplined Developmental Evaluation Framework Matrices and Scientific Test and Analysis Techniques (STAT).<br>- Support rapid prototyping, rapid fielding, and technology demonstrations efforts in the development of tailored comprehensive, efficient, and innovative Cybersecurity DT&E strategies/plans.<br>- Implement the OUSD(R&E) 'Shift Left' initiative that focuses on ensuring Cybersecurity DT&E strategies/plans are developed in advance of releasing Technology Maturation and Risk Reduction (TMRR) and Engineering and Manufacturing Development (EMD) RFPs, and increasing the amount and quality of data available to support production decisions.<br>- Refine Cybersecurity DT&E policies and methodologies addressing Cybersecurity DT&E across all Acquisition programs.<br>- When requested by the Secretary or Deputy Secretary of Defense, provide independent Cybersecurity developmental test assessments in support of USD(A&S) and Service Major Defense Acquisition Programs.<br>- Promote the application of sound Cybersecurity DT&E and related technical disciplines across the Department's acquisition community and programs.<br>- Implement initiatives that evolve the Cybersecurity DT&E 'state of practice' to keep pace with emerging technologies and improve test efficiency to field systems faster.<br>- Implement initiatives to guide acquisition programs for how to use Cybersecurity T&E planning and analysis and Cybersecurity tests to identify and mitigate cyber risk in supply chains, development environments, tools and processes.<br>- Collaborate with the Intelligence communities to improve cyber intelligence support to Cybersecurity DT&E.<br>- Work with Lead DT&E organizations to improve Cybersecurity DT&E workforce capability and retention as well as capacity to support earlier integrated contractor and government Cybersecurity DT&E.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Establish Cybersecurity DT&E for Weapon Systems in PE 0605804D8Z/048. | | | |
| **Accomplishments/Planned Programs Subtotals** | 0.000 | 0.000 | 7.000 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0605804D8Z / *Development Test & Evaluation* | **Project (Number/Name)**<br>048 / *Cybersecurity DT&E for Weapon Systems* |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support* | **R-1 Program Element (Number/Name)**<br>PE 0606100D8Z / *Budget and Program Assessments* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 34.281 | 5.544 | 8.017 | 13.173 | - | 13.173 | 15.330 | 13.372 | 11.562 | 11.755 | Continuing | Continuing |
| 101: *Budget and Program Assessments* | 34.281 | 3.752 | 4.017 | 7.176 | 0.000 | 7.176 | 7.334 | 7.375 | 7.566 | 7.678 | Continuing | Continuing |
| 107: *Internet DMZ Migration* | 0.000 | 1.792 | 0.000 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| 118: *Enterprise VAMOSC* | 0.000 | 0.000 | 4.000 | 5.997 | 0.000 | 5.997 | 7.996 | 5.997 | 3.996 | 4.077 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

This program supports the Office of the Director, Cost Assessment & Program Evaluation (CAPE) by funding assessments that help to resolve budget and programmatic issues across the full range of the Department's activities. Projects that support this effort help to inform the leadership on program alternatives, capability concept development, design and cost, as well as the appropriate balance of capabilities across the force, and also to identify how well the Department's expenditures are meeting its goals, and how well the force can implement the National Defense Strategy. These RDT&E resources support critical studies and analyses to assist senior DoD leaders in optimally balancing the lethality, partnership, and reform levels of effort to carry out the National Defense Strategy.

This program provides for analytical research across the entire spectrum of defense issues and concerns. The research agenda focuses on near to long-term problems identified by the Secretary of Defense, addressing difficult and complex questions linked to program alternatives for current and future capabilities and forces in order to enhance the senior leadership's deliberations and decision-making.

This program provides the scientific and technical engineering services needed for research studies in the development of models and simulations and the evaluation of current analytical tools and scientific methods used to evaluate and assess weapons systems and warfighting capabilities for warfighting environments and scenarios, and related force structure. Deliverables from this program will include reports, briefings, and analyses designed to illuminate critical issues facing the Department. Outcomes include recommendations for new modeling techniques, programmatic alternatives, and scenario development.

In FY 2019 CAPE received increased funding from the DoD Joint Service Provider to support the migration, implementation, and sustainment of its DoD Non-Classified Internet Protocol Router Network Demilitarized Zone (DMZ) efforts. In addition to the one-year increased RDT&E funding for FY 2019 itemized in this exhibit, CAPE also received additional Procurement and Operation and Maintenance (O&M) funding throughout the FY 2019-2023 FYDP to support the migration and sustainment of these developmental solutions. CAPE's funds are included in the total Internet DMZ Migration amount transferred from JSP to OSD so that CAPE and three other affected OSD Principal Staff Assistants (PSAs) can execute their own long-term solutions outside of the JSP DMZ.

The FY 2021 budget proposal includes additional resources to support the Enterprise Visiability and Maintainability of Operation and Support Costs (EVAMOSC). This was a new project in FY 2020. EVAMOSC supports CAPE's responsibility to develop and maintain a database of actual operating and support (O&S) costs for major weapons systems, as required in 10 USC Ch. 137, Sec. 2337a and further refined by Sec. 832 of the 2019 NDAA. Additionally, the EVAMOSC data capability will

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support* | **R-1 Program Element (Number/Name)**<br>PE 0606100D8Z / *Budget and Program Assessments* |

directly support development and reporting of readiness metrics associated with implementation of the National Defense Strategy. In FY 2021 CAPE will continue to design and develop an enterprise data platform to serve as the authoritative source of Operating and Support (O&S) cost data for major weapon systems.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 5.755 | 8.017 | 9.823 | 0.000 | 9.823 |
| Current President's Budget | 5.544 | 8.017 | 13.173 | 0.000 | 13.173 |
| Total Adjustments | -0.211 | 0.000 | 3.350 | 0.000 | 3.350 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | -0.001 | - | | | |
| • SBIR/STTR Transfer | -0.210 | - | | | |
| • Inflation Adjustment | 0.000 | 0.000 | -0.010 | 0.000 | -0.010 |
| • Directed Adds | 0.000 | 0.000 | 4.042 | 0.000 | 4.042 |
| • Defense Wide Review Studies Reduction | 0.000 | 0.000 | -0.682 | 0.000 | -0.682 |

**Change Summary Explanation**

Outyear numbers reflect fiscal guidance, revised inflation guidance, and programmatic changes. The FY 2021 funding increase reflects direction for CAPE to continue work started in FY 2020 to develop and maintain a database of actual operating and support costs for major weapons systems, known as EVAMOSC. In addition to the RDT&E funding for EVAMOSC described in this exhibit, CAPE also received additional Operation and Maintenance (O&M) funding in FY 2023, FY 2024, and FY 2025 to support EVAMOSC operational efforts. These funds will enable CAPE to develop and maintain a reference database of actual operating and support (O&S) costs for major weapons systems. Finally the Defense Wide Review realigned RDT&E study funding to provide additional resources directly to CAPE for budget and program assessments.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 6 | R-1 Program Element (Number/Name)<br>PE 0606100D8Z / *Budget and Program Assessments* | Project (Number/Name)<br>101 / *Budget and Program Assessments* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 101: *Budget and Program Assessments* | 34.281 | 3.752 | 4.017 | 7.176 | 0.000 | 7.176 | 7.334 | 7.375 | 7.566 | 7.678 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

This program supports the Office of the Director, Cost Assessment & Program Evaluation (CAPE). It funds assessments that help to resolve budget and programmatic issues across the full range of the Department's activities. Projects that support this effort help to inform the leadership on program alternatives, capability concept development, design and cost, the appropriate balance of capabilities across the force, and also to identify how well the Department's expenditures are meeting its goals, and how well the force can implement the Defense strategy.

This program provides for analytical research across the entire spectrum of defense issues and concerns. The research agenda focuses on near to long-term problems identified by the Secretary of Defense, and addresses difficult and complex questions linked to program alternatives for current and future capabilities and forces in order to enhance DoD senior leadership's deliberations and decision-making.

This program provides the scientific and technical engineering services needed for research studies in the development of models and simulations and the evaluation of current analytical tools and scientific methods used to evaluate and assess weapons systems and warfighting capabilities for warfighting environments and scenarios, and related force structure. Deliverables from this program will include reports, briefings, and analyses designed to illuminate critical issues facing the Department. Outcomes include recommendations for new modeling techniques, programmatic alternatives, and scenario development.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** OSD Support for Programming Budget | 3.752 | 4.017 | 7.176 |
| ***Description:*** This program provides for analytical research across the entire spectrum of defense issues and concerns. The research agenda focuses on near to long-term problems identified by the Secretary of Defense, and addresses difficult and complex questions linked to program alternatives for current and future capabilities and forces in order to enhance senior leadership deliberations and decision-making.<br><br>***FY 2020 Plans:***<br>Studies, analyses, and assessments will focus on:<br>- Improving cost analysis tools to inform program, budget, and Defense Acquisition Board reviews.<br>- supporting the Weapon System Acquisition Reform Act (WSARA) requirements by independently assessing, analyzing, and where appropriate, updating cost indices, inflation rates, and escalation rates used in preparing the President's Budget for major acquisition programs. | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0606100D8Z / *Budget and Program Assessments* | **Project (Number/Name)**<br>101 / *Budget and Program Assessments* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| - Developing, assessing, and enhancing databases that provide cost data for major weapon systems. This includes the development and maintenance of a database of actual operating and support (O&S) costs for major weapon systems as required in Title 10 United States Code and further refined by the FY 2019 National Defense Authorization Act.<br>- Improving estimates produced by the Defense Employment and Purchases Projection System (DEPPS) and Defense Translator, which are used to support decision briefs to the President, Congress, Secretary of Defense, and Deputy Secretary of Defense.<br>- Modeling and analyzing aircraft survivability against various threat detection approaches and in various operational environments. Assessing the ability of aircraft and weapons to operation in anti-access/area denial regions.<br>- Modeling logistical vulnerabilities against various threats and in various operational environments. Assessing the cost and mission effectiveness of proposed improvements.<br>- Expanding analysis of OCO funding data to determine how funding was actually spent as distinguished from DoD base budget resources. Provide normalization information that can be applied to existing Defense Resources Data Warehouse (DRDW) data for the current budget position. | | | |
| ***FY 2021 Plans:***<br>Studies, analyses, and assessments will be focused on:<br>- Improving cost analysis tools to inform program, budget, and Defense Acquisition Board reviews.<br>- Supporting the Weapon System Acquisition Reform Act (WSARA) requirements by independently assessing, analyzing, and where appropriate, updating cost indices, inflation rates, and escalation rates used in preparing the FY 2021 President's Budget for major acquisition programs.<br>- Developing, assessing, and enhancing databases that provide cost data for major weapon systems. This includes the development and maintenance of a database of actual operating and support (O&S) costs for major weapon systems as required in Title 10 United States Code and further refined by the FY 2019 National Defense Authorization Act.<br>- Improving estimates produced by the Defense Employment and Purchases Projection System (DEPPS) and Defense Translator, which are used to support decision briefs to the President, Congress, Secretary of Defense, and Deputy Secretary of Defense.<br>- Modeling and analyzing aircraft survivability against various threat detection approaches and in various operational environments. Assessing the ability of aircraft and weapons to operation in anti-access/area denial regions.<br>- Modeling logistical vulnerabilities against various threats and in various operational environments. Assessing the cost and mission effectiveness of proposed improvements.<br>- Expanding analysis of OCO funding data to determine how funding was actually spent as distinguished from DoD base budget resources. Provide normalization information that can be applied to existing Defense Resources Data Warehouse (DRDW) data for the current budget position. | | | |
| ***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>FY 2021 funding levels resources directed to develop and maintain an enterprise database of actual operating and support costs. CAPE RDT&E resources will fund a mix of research activities to carry out the plans stated above. As a result of the Defense | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0606100D8Z / *Budget and Program Assessments* | **Project (Number/Name)**<br>101 / *Budget and Program Assessments* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Wide Review, additional resources are also provided to CAPE for studies and assessments that were previous funded through USD(A&S). | | | |
| **Accomplishments/Planned Programs Subtotals** | 3.752 | 4.017 | 7.176 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

A mix of competitive contracts with commercial firms and research provided by university-affiliated research centers (UARCs), and Federally Funded Research and Development Centers (FFRDCs).

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 6 | R-1 Program Element (Number/Name)<br>PE 0606100D8Z / *Budget and Program Assessments* | Project (Number/Name)<br>107 / *Internet DMZ Migration* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 107: *Internet DMZ Migration* | 0.000 | 1.792 | 0.000 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

Internet DMZ Migration reflects CAPE activities as part of a broader DoD effort to provide additional funds to Office of the Secretary of Defense (OSD) Principal Staff Assistants to enable them to migrate, implement, and sustain their DoD Non-classified Internet Protocol Router Network Demilitarized Zones (DMZ) efforts. CAPE's RDT&E funds supported initial cloud development and conversion costs in FY 2019. This RDT&E funding was for FY 2019 only.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Internet DMZ Migration | 1.792 | - | - |
| ***Description:*** In FY 2019 CAPE received increased funding from the DoD Joint Service Provider to support the migration, implementation, and sustainment of its DoD Non-Classified Internet Protocol Router Network Demilitarized Zone (DMZ) efforts. In addition to the increased RDT&E funding described in this exhibit, CAPE also received additional Procurement and Operation and Maintenance (O&M) funding to support the migration and ongoing sustainment of these developmental efforts. CAPE's funds were included in the total Internet DMZ Migration amount transferred from JSP to OSD so that CAPE and three other affected OSD Principal Staff Assistants (PSAs) could execute their own long-term solutions outside of the JSP DMZ. | | | |
| **Accomplishments/Planned Programs Subtotals** | 1.792 | - | - |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A for FY 2020 and beyond

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 6 | R-1 Program Element (Number/Name)<br>PE 0606100D8Z / *Budget and Program Assessments* | Project (Number/Name)<br>118 / *Enterprise VAMOSC* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 118: *Enterprise VAMOSC* | 0.000 | 0.000 | 4.000 | 5.997 | 0.000 | 5.997 | 7.996 | 5.997 | 3.996 | 4.077 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

Enterprise VAMOSC addresses CAPE's responsibility to develop and maintain a database of actual operating and support (O&S) costs for major weapons systems, as required in 10 USC Ch. 137, Sec. 2337a and further refined by Sec. 832 of the 2019 National Defense Authorization Act (NDAA). Additionally, the EVAMOSC data capability will directly support development and reporting of readiness metrics associated with implementation of the National Defense Strategy.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Enterprise Visibility and Maintainability of Operating and Support Costs | 0.000 | 4.000 | 5.997 |
| ***Description:*** Enterprise VAMOSC addresses CAPE's responsibility to develop and maintain a database of actual operating and support (O&S) costs for major weapons systems, as required in 10 USC Ch. 137, Sec. 2337a and further refined by Sec. 832 of the 2019 NDAA. Additionally, the EVAMOSC data capability will directly support development and reporting of readiness metrics associated with implementation of the National Defense Strategy.<br><br>***FY 2020 Plans:***<br>• Analyze gaps in current weapons system O&S data and refine the DoD's enterprise-level O&S data map<br>• Develop business rules, data dictionaries, and governance to support collection and reporting of enterprise-level O&S cost data<br>• Identify and develop processing, data analysis, general functionality, and system use requirements for an enterprise-level O&S cost data capability<br><br>***FY 2021 Plans:***<br>• Design and develop an enterprise data platform to serve as the authoritative source of O&S cost data for major weapon systems<br>• Develop data ingestion pipelines, business rules, logic models, and data catalogues to support collection, reporting, and analysis of enterprise-level O&S cost data<br>• Develop system administration, security, and user management functionality for an enterprise data asset anticipated to provide services to over 3,000 users across the DoD.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>FY 2021 funding reflects increased resources provided specifically for EVAMOSC in order to meet Title 10 requirements. | | | |
| **Accomplishments/Planned Programs Subtotals** | 0.000 | 4.000 | 5.997 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0606100D8Z / *Budget and Program Assessments* | **Project (Number/Name)**<br>118 / *Enterprise VAMOSC* |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

N/A

**D. Acquisition Strategy**

A mix of competitive contracts with commercial firms and research provided by university-affiliated research centers (UARCs) and Federally Funded Research and Development Centers (FFRDCs).

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support* | **R-1 Program Element (Number/Name)**<br>PE 0606225D8Z / *ODNA Technology & Research Analysis* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 4.498 | 1.028 | 3.194 | 3.200 | - | 3.200 | 3.088 | 3.157 | 3.223 | 3.324 | Continuing | Continuing |
| 106: *Technology and Research Analysis* | 4.498 | 1.028 | 3.194 | 3.200 | - | 3.200 | 3.088 | 3.157 | 3.223 | 3.324 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

The Office of Net Assessment develops and coordinates analyses that examine the standing trends and future prospects of U.S. and other military capabilities and military potential. The net assessments address near and long-term problems and opportunities for the U.S. military forces to help counter technological advantages of potential adversaries of the United States. These efforts will pursue research to analyze the future security environment.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 1.028 | 3.194 | 3.477 | - | 3.477 |
| Current President's Budget | 1.028 | 3.194 | 3.200 | - | 3.200 |
| Total Adjustments | 0.000 | 0.000 | -0.277 | - | -0.277 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | - | - | | | |
| • Defense Wide Review | - | - | -0.274 | - | -0.274 |
| • Inflation | - | - | -0.003 | - | -0.003 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 6 | R-1 Program Element (Number/Name)<br>PE 0606225D8Z / *ODNA Technology & Research Analysis* | Project (Number/Name)<br>106 / *Technology and Research Analysis* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 106: *Technology and Research Analysis* | 4.498 | 1.028 | 3.194 | 3.200 | - | 3.200 | 3.088 | 3.157 | 3.223 | 3.324 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

The Office of Net Assessment develops and coordinates analyses that examine the standing trends and future prospects of U.S. and other military capabilities and military potential. The net assessments address near and long-term problems and opportunities for the U.S. military forces to help counter technological advantages of potential adversaries of the United States. These efforts will pursue research to analyze the future security environment.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Technology and Research Analysis | 1.028 | 3.194 | 3.200 |

***Description:*** The Office of Net Assessment develops and coordinates analyses that examine the standing trends and future prospect of U.S. and other military capabilities and military potential. The net assessments address near and long-term problems and opportunities for the U.S. military forces to help counter technological advantages of potential adversaries of the United States. These efforts will pursue research to analyze the future security environment.

***FY 2020 Plans:***

Continue and initiate efforts to pursue research that analyzes the future security environment, including:
- Continue analysis on future concepts of operation and possible courses of action and responses to emerging capabilities.
- Continue investment in a Biosciences Net Assessment and initiate analysis in future warfare areas to assess potential revolutionary advances.
- Continue analysis in AI to identify areas of consideration for potential advanced capability demonstrations.

***FY 2021 Plans:***

Continue and initiate efforts to pursue research that that identifies new technological innovations and analyzes the future security environment, including:
- Continuing analysis on future concepts of operation and possible courses of action and responses to emerging capabilities.
- Continuing investment in a Biosciences Net Assessment and initiating analysis in future warfare areas to assess potential revolutionary advances.
- Initiating analysis in Information areas for potential advanced capability demonstrations and a potential Net Assessment.

***FY 2020 to FY 2021 Increase/Decrease Statement:***

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0606225D8Z / *ODNA Technology & Research Analysis* | **Project (Number/Name)**<br>106 / *Technology and Research Analysis* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| Increase for program continuation | | | |
| **Accomplishments/Planned Programs Subtotals** | 1.028 | 3.194 | 3.200 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

N/A

**D. Acquisition Strategy**

N/A

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support* | **R-1 Program Element (Number/Name)**<br>PE 0203345D8Z / *Defense Operations Security Initiative (DOSI)* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 7.549 | 9.892 | 8.037 | 3.099 | - | 3.099 | 3.164 | 3.180 | 3.248 | 3.313 | Continuing | Continuing |
| 345: *Defense Operations Security Initiative* | 7.549 | 9.892 | 8.037 | 3.099 | - | 3.099 | 3.164 | 3.180 | 3.248 | 3.313 | Continuing | Continuing |

**Program MDAP/MAIS Code:**
**Project MDAP/MAIS Code(s):** 003

## A. Mission Description and Budget Item Justification

DOSI establishes and leads the Department's next generation Operations Security (OPSEC) capability development and affiliated investment strategy. Investments support DoD's current and emerging OPSEC capability gaps, including countering advances in non-U.S. Intelligence, Surveillance, and Reconnaissance (ISR) capabilities and denying the understanding of U.S. capability, capacity, readiness and critical technology and information from adversaries. These investments spur Department innovation and preserve U.S. technology superiority. DOSI Analysis and Engineering Studies lead the community's ability to sustain and maximize technology advantage as they are transitioned to Service and Agency programs for sustainment, maintenance, and capacity programming. Test and evaluation analyses establish measure and countermeasure effectiveness in current and emerging operational environments.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 9.985 | 3.037 | 3.099 | - | 3.099 |
| Current President's Budget | 9.892 | 8.037 | 3.099 | - | 3.099 |
| Total Adjustments | -0.093 | 5.000 | 0.000 | - | 0.000 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | 5.000 | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | -0.091 | - | | | |
| • Departmental Adjustment | -0.002 | - | - | - | - |

| Congressional Add Details ($ in Millions, and Includes General Reductions) | FY 2019 | FY 2020 |
|---|---|---|
| **Project:** 345: *Defense Operations Security Initiative* | | |
| Congressional Add: *Cyber Kinetic Range Capabilities - Development of Playas Training and Research Center (PTRC) as a facility of interest in the execution of the Cyber Kinetic Combat Environment activities.* | 7.000 | 5.000 |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 6: *RDT&E Management Support* | **R-1 Program Element (Number/Name)**<br>PE 0203345D8Z *I Defense Operations Security Initiative (DOSI)* |

| Congressional Add Details ($ in Millions, and Includes General Reductions) | FY 2019 | FY 2020 |
|---|---|---|
| Congressional Add Subtotals for Project: 345 | 7.000 | 5.000 |
| Congressional Add Totals for all Projects | 7.000 | 5.000 |

**Change Summary Explanation**

Congressional Add in FY2020 for Cyber Kinetic Combat Environment.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | | | | | | | | | Date: February 2020 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 6 | | | | | R-1 Program Element (Number/Name)<br>PE 0203345D8Z / *Defense Operations Security Initiative (DOSI)* | | | | Project (Number/Name)<br>345 / *Defense Operations Security Initiative* | | | |
| **COST ($ in Millions)** | **Prior Years** | **FY 2019** | **FY 2020** | **FY 2021 Base** | **FY 2021 OCO** | **FY 2021 Total** | **FY 2022** | **FY 2023** | **FY 2024** | **FY 2025** | **Cost To Complete** | **Total Cost** |
| 345: *Defense Operations Security Initiative* | 7.549 | 9.892 | 8.037 | 3.099 | - | 3.099 | 3.164 | 3.180 | 3.248 | 3.313 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**Project MDAP/MAIS Code:** 003

**A. Mission Description and Budget Item Justification**

DOSI establishes and leads the Department's next generation Operations Security (OPSEC) capability development and affiliated investment strategy. Investments support DoD's current and emerging OPSEC capability gaps, including countering advances in non-U.S. Intelligence, Surveillance, and Reconnaissance (ISR) capabilities and denying the understanding of U.S. capability, capacity, readiness and critical technology and information from adversaries. These investments spur Department innovation and preserve U.S. technology superiority. DOSI analyses and engineering activities lead the community's ability to sustain and maximize technology advantages as they are transitioned to Service and Agency programs for sustainment, maintenance, and capacity programming. Results of tests and evaluations enable the community to identify OPSEC measure and countermeasure effectiveness in current and emerging operational environments.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Defense Operations Security Initiative | 2.892 | 3.037 | 3.099 |
| ***Description:*** RDT&E investments focused on countering advances in non-U.S. ISR capabilities and denying understanding of U.S. capability, capacity, readiness and critical technology and information. These investments spurred Department innovation towards preserving U.S. information and technology superiority. DOSI's analyses and engineering activities enabled the OPSEC community's ability to sustain and maximize technological advantages.<br><br>FY 2019 Accomplishments:<br>- Development of critical infrastructure protection playbook for utilization by Commanders of OCONUS bases possessing key infrastructure of targeting interest to non-U.S. ISR<br>- Development of unique signature emulation and denial technologies to counter A2/AD capabilities and present operational dilemmas<br>- Development of unique technical prototypes to protect critical technology and information<br><br>***FY 2020 Plans:***<br>- Oversee research, development, and testing on next generation capabilities that counter foreign ISR capabilities and deny understanding of U.S. capability, capacity, readiness and critical technology and information.<br>- Developing unique technical cyber prototypes to protect critical technology and information. | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0203345D8Z / *Defense Operations Security Initiative (DOSI)* | **Project (Number/Name)**<br>345 / *Defense Operations Security Initiative* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| - Developing OPSEC cyber framework for enabling signature management towards denying collection and exploitation of critical technology and information.<br>- Developing unique technical capability to protect specific ground systems and units from non-U.S. ISR capabilities.<br>***FY 2021 Plans:***<br>- Continue to oversee research, development, and testing on next generation capabilities that counter foreign ISR capabilities and deny understanding of U.S. capability, capacity and readiness.<br>- Continue to provide oversight and advocacy for transitioning developed capabilities into formalized program offices and program executive offices across DoD Components.<br>- Continue to participate in Defense RDT&E processes to advance basic and applied research, science, and technology, and technology development and testing to elevate OPSEC capability and capacity across the Department.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>No significate change. | | | |
| **Accomplishments/Planned Programs Subtotals** | 2.892 | 3.037 | 3.099 |

| | FY 2019 | FY 2020 |
|---|---|---|
| ***Congressional Add:*** Cyber Kinetic Range Capabilities - Development of Playas Training and Research Center (PTRC) as a facility of interest in the execution of the Cyber Kinetic Combat Environment activities. | 7.000 | 5.000 |
| ***FY 2019 Accomplishments:*** - -Conducted Proof of Concept (POC) 2 demonstrating multi-discipline training potential.<br>- Developed plans and documentation to support establishment of secure facilities at Socorro and Playas.<br>- Conducted POC 3 integrating airborne and terrestrial effects, introducing Joint Information Operations Range (JIOR) access and exercise classified capabilities. | | |
| ***FY 2020 Plans:*** - Establish Full Operating Capability for Government Furnished Equipment Cell network system.<br>- Advance JIOR connectivity, remote access, trenching fiber build.<br>- Perform Radio Frequency (RF) survey for fiber network infrastructure development.<br>- Validate open air RF operations, airspace and Electronic Attack spectrum clearance expansion.<br>- Support additional POC for warfighter requirements development and infrastructure build.<br>- Build/upgrade Playas security infrastructure.<br>- Build/upgrade network connectivity to support terrestrial and airborne integration. | | |
| **Congressional Adds Subtotals** | 7.000 | 5.000 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0203345D8Z / *Defense Operations Security Initiative (DOSI)* | **Project (Number/Name)**<br>345 / *Defense Operations Security Initiative* |

**C. Other Program Funding Summary ($ in Millions)**

| Line Item | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|
| • 0203345D8Z O&M DW: *Defense Operations Security Initiative* | 1.954 | 2.738 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

**Remarks**

**D. Acquisition Strategy**

The acquisition, management, and contracting strategy involves the following:

• Adhere to guidance outlined in DoD 5000, Directive 7, Federal Acquisition Regulations (FAR), and FAR Supplement Policies and Procedures.

• RDT&E OPSEC capabilities, systems, tools, products, and services through a disciplined, yet agile, process that ensures signature management and signature obfuscation capabilities are available for DoD components.

• Sustain an acquisition process that is responsive and responsible to internal and external customers and stakeholders.

• Continue to support the warfighter's need for capabilities that dominate today's dynamic, networked battlespace by providing strategy across the DoD for the planning and execution of OPSEC.

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support* | **R-1 Program Element (Number/Name)**<br>PE 0303260D8Z / *Defense Military Deception Program Office (DMDPO)* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 1.875 | 0.966 | 1.014 | 1.036 | - | 1.036 | 1.048 | 1.063 | 1.086 | 1.108 | Continuing | Continuing |
| 891: *Defense Military Deception Program* | 1.875 | 0.966 | 1.014 | 1.036 | - | 1.036 | 1.048 | 1.063 | 1.086 | 1.108 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

The Sensitive Messaging and Operations in the Information Environment (SM&OIE) RDT&E program, repurposed out of the prior Defense Military Deception Program Office, brings value to the Defense Intelligence Enterprise by investing in new ideas and technologies to support growing Department-wide SM&OIE activities. The SM&OIE RDT&E program enhances acquisition and mission execution by helping transition new technologies, fund studies, conduct analyses of alternatives, develop product improvement efforts, and provide funding for SM&OIE innovation efforts. The program pursues projects that provide incremental improvements as well as those with the greatest potential to strategically transform DoD SM&OIE, with a primary focus on closing capabilities gaps. Program supports growing interest in SM&OIE from the Executive Office of the President, Congress, the National Security Council, and the National Intelligence Council.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 1.003 | 1.014 | 1.036 | - | 1.036 |
| Current President's Budget | 0.966 | 1.014 | 1.036 | - | 1.036 |
| Total Adjustments | -0.037 | 0.000 | 0.000 | - | 0.000 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | -0.037 | - | | | |

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Defense Military Deception Program Office | 0.966 | 1.014 | 1.036 |
| ***Description:*** The Sensitive Messaging and Operations in the Information Environment (SM&OIE) RDT&E program, repurposed out of the prior Defense Military Deception Program Office, brings value to the Defense Intelligence Enterprise by investing in new ideas and technologies to support growing Department-wide SM&OIE activities. The SM&OIE RDT&E program enhances acquisition and mission execution by helping transition new technologies, fund studies, conduct analyses of alternatives, develop product improvement efforts, and provide funding for SM&OIE innovation efforts. The program pursues projects that provide | | | |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support* | **R-1 Program Element (Number/Name)**<br>PE 0303260D8Z / *Defense Military Deception Program Office (DMDPO)* |

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| incremental improvements as well as those with the greatest potential to strategically transform DoD SM&OIE, with a primary focus on closing capabilities gaps. Program supports growing interest in SM&OIE from the Executive Office of the President, Congress, the National Security Council, and the National Intelligence Council.<br><br>***FY 2020 Plans:***<br>- Oversee research, development and testing programs related to Sensitive Messaging affiliated with current CCMD and Service requirements.<br>- Oversee research, development and testing programs related to Operations in the Information Environment affiliated with current CCMD and Service requirements.<br>- Provide oversight and advocacy for transitioning developed capabilities into formalized program offices and program executive offices across DoD Components.<br><br>***FY 2021 Plans:***<br>- Continue to oversee research, development and testing programs related to Sensitive Messaging affiliated with current CCMD and Service requirements.<br>- Continue to provide oversight and advocacy for transitioning developed capabilities into formalized program offices and program executive offices across DoD Components.<br>- Continue to participate in Defense RDT&E processes to advance basic and applied research, science and technology, and technology development and testing to elevate Sensitive Messaging and Operations in the Information Environment capability and capacity across the Department.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>No significant change. | | | |
| **Accomplishments/Planned Programs Subtotals** | 0.966 | 1.014 | 1.036 |

**D. Other Program Funding Summary ($ in Millions)**

| Line Item | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|
| • 0303260D8Z O&M DW: *Defense Military Deception Program Office* | 1.000 | 1.062 | 1.105 | - | 1.105 | 1.134 | 1.177 | 1.353 | 1.353 | Continuing | Continuing |

**Remarks**

**E. Acquisition Strategy**

The acquisition, management, and contracting strategy involves the following:
• Adhere to guidance outlined in DoD 5000, Directive 7, Federal Acquisition Regulations (FAR), and FAR Supplement Policies and Procedures.

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 6: *RDT&E Management Support* | **R-1 Program Element (Number/Name)**<br>PE 0303260D8Z *I Defense Military Deception Program Office (DMDPO)* |

• Acquire and sustain SM&OIE capabilities, systems, tools, products, and services through a disciplined, yet agile, process that ensures information related capabilities are available for DoD components.
• Sustain an acquisition process that is responsive and responsible to internal and external customers and stakeholders.
• Continue to support the warfighter's need for capabilities that dominate today's dynamic, networked battlespace by providing governance, oversight, and strategy across the DoD for the planning and execution of SM&OIE activities.

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support* | **R-1 Program Element (Number/Name)**<br>PE 0305245D8Z / *Intelligence Capabilities and Innovation* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 15.255 | 188.876 | 15.871 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 220.002 |
| 245: *Innovation* | 15.255 | 188.876 | 15.871 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 220.002 |

**Note**

DWR: Defense-Wide (DW) Review adjustment - Eliminate Defense Intelligence Innovation Office (DI2O).

**A. Mission Description and Budget Item Justification**

Intelligence Capabilities and Innovation (ICI) funds intelligence problem curation processes, commercial technology piloting, and the development, testing, prototyping and demonstration of innovative intelligence capabilities to integrate intelligence and counterintelligence activities across numerous domains and technical areas including Signals Intelligence (SIGINT), Measurements and Signature Intelligence (MASINT), electronic warfare, cyber, Geospatial Intelligence (GEOINT), multi-sensor integration, biometrics, identity management, collection management, special communications, clandestine operations, and tagging, tracking and locating. Innovation is the rapid experimentation and development of existing technologies (hardware, software, licenses, databases, analytics, etc.) to create new capabilities and demonstrate their intelligence value in support of warfighter operations.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 189.529 | 21.081 | 20.640 | - | 20.640 |
| Current President's Budget | 188.876 | 15.871 | 0.000 | - | 0.000 |
| Total Adjustments | -0.653 | -5.210 | -20.640 | - | -20.640 |
| • Congressional General Reductions | - | -5.210 | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | -0.120 | - | | | |
| • SBIR/STTR Transfer | - | - | | | |
| • Departmental Adjustments | -0.533 | - | -20.640 | - | -20.640 |

**Change Summary Explanation**

DWR: Defense-Wide (DW) Review adjustment - Eliminate Defense Intelligence Innovation Office (DI2O).

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 6 | R-1 Program Element (Number/Name)<br>PE 0305245D8Z / *Intelligence Capabilities and Innovation* | Project (Number/Name)<br>245 / *Innovation* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 245: *Innovation* | 15.255 | 188.876 | 15.871 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 220.002 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

Intelligence Capabilities and Innovation funds the development, testing, prototyping and demonstration of innovative intelligence capabilities to integrate intelligence and counterintelligence activities across numerous domains and technical areas including SIGINT, MASINT, electronic warfare, cyber, GEOINT, multi-sensor integration, biometrics, identity management, collection management, special communications, clandestine operations, and tagging, tracking and locating.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** ICI | 188.876 | 15.871 | 0.000 |
| ***Description:*** Intelligence Capabilities and Innovation funds the development, testing, prototyping and demonstration of innovative intelligence capabilities to integrate intelligence and counterintelligence activities across numerous domains and technical areas including SIGINT, MASINT, electronic warfare, cyber, GEOINT, multi-sensor integration, biometrics, identity management, collection management, special communications, clandestine operations, and tagging, tracking and locating.<br><br>***FY 2020 Plans:***<br>Develop intelligence and innovation capabilities and capacity to support Combatant Commands, Combat Support Agencies, and Services. New focus areas are aligned to the National Defense Strategy and meeting the Secretary of Defense goals to increase lethality for the Department of Defense.<br><br>***FY 2021 Plans:***<br>Defense Wide Review - Intelligence decision to discontinue program.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Decrease between FY 2020 and FY 2021 is due to a Defense Wide Review Departmental Decision to discontinue program. | | | |
| **Accomplishments/Planned Programs Subtotals** | 188.876 | 15.871 | 0.000 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0305245D8Z / *Intelligence Capabilities and Innovation* | **Project (Number/Name)**<br>245 / *Innovation* |

**D. Acquisition Strategy**

Intelligence Capabilities and Innovation acquisition, management, and contracting strategy follows guidance outlined in the DoD 5000 series directives, Federal Acquisition Regulation (FAR) and FAR supplement policies and procedures. Management uses project management tools and meetings to ensure delivery of stated capabilities and performance criteria.

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support* | **R-1 Program Element (Number/Name)**<br>PE 0306310D8Z / *CWMD Systems: RDT&E Management Support* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 1.229 | 1.195 | 0.000 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 2.424 |
| 814: *CWMD Systems: RDT&E Management Support* | 1.229 | 1.195 | 0.000 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 2.424 |

**Note**

This Program Element (PE) was discontinued beginning in FY 2020. Funds were redistributed to the Countering Weapons of Mass Destruction (CWMD) Systems: Advanced Technology Development (PE# 0303310D8Z), CWMD Systems: System Development and Demonstration (PE# 0305310D8Z), and CWMD Systems: Operational Systems Development (PE# 0607310D8Z) program elements.

**A. Mission Description and Budget Item Justification**

This Program Element (PE) funded RDT&E management support for planning, development, integration and fielding of CWMD technologies and systems, including situational awareness information systems, or other systems as needed.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 1.241 | 0.000 | 0.000 | - | 0.000 |
| Current President's Budget | 1.195 | 0.000 | 0.000 | - | 0.000 |
| Total Adjustments | -0.046 | 0.000 | 0.000 | - | 0.000 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | -0.046 | - | | | |

**Change Summary Explanation**

This Program Element (PE) was discontinued beginning in FY 2020. Funds were redistributed to the Countering Weapons of Mass Destruction (CWMD) Systems: Advanced Technology Development (PE# 0303310D8Z), CWMD Systems: System Development and Demonstration (PE# 0305310D8Z), and CWMD Systems: Operational Systems Development (PE# 0607310D8Z) program elements.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 6 | R-1 Program Element (Number/Name)<br>PE 0306310D8Z / *CWMD Systems: RDT&E Management Support* | Project (Number/Name)<br>814 / *CWMD Systems: RDT&E Management Support* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 814: *CWMD Systems: RDT&E Management Support* | 1.229 | 1.195 | 0.000 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 2.424 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**Note**

This Program Element (PE) was discontinued beginning in FY 2020. Funds were redistributed to the Countering Weapons of Mass Destruction (CWMD) Systems: Advanced Technology Development (PE# 0303310D8Z), CWMD Systems: System Development and Demonstration (PE# 0305310D8Z), and CWMD Systems: Operational Systems Development (PE# 0607310D8Z) program elements.

**A. Mission Description and Budget Item Justification**

This Program Element (PE) funded RDT&E management support for planning, development, integration and fielding of CWMD technologies and systems, including situational awareness information systems, or other systems as needed.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** P*814 / CWMD Systems: RDT&E Management Support | 1.195 | 0.000 | 0.000 |
| ***Description:*** RDT&E management support for planning, development, integration and fielding of CWMD technologies and systems, including situational awareness information systems, or other systems as needed.<br><br>***FY 2020 Plans:***<br>None.<br><br>***FY 2021 Plans:***<br>None. | | | |
| **Accomplishments/Planned Programs Subtotals** | 1.195 | 0.000 | 0.000 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 6: *RDT&E Management Support* | **R-1 Program Element (Number/Name)**<br>PE 0307588D8Z *I Algorithmic Warfare Cross Functional Team (AWCFT)* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 0.000 | 0.000 | 221.235 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 221.235 |
| 590: *Algorithmic Warfare Cross Functional Team (AWCFT)* | 0.000 | 0.000 | 221.235 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 221.235 |

**A. Mission Description and Budget Item Justification**

Algorithmic Warfare Cross Functional Team (AWCFT) funds Project Maven, a rapid fielding Artificial Intelligence (AI) program to augment and automate Processing, Exploitation and Dissemination (PED) for Full Motion Video (FMV) Tactical Unmanned Aerial Vehicles (TUAVs), Medium Altitude, High Altitude, and Wide Area Motion Imagery (WAMI) Intelligence, Surveillance and Reconnaissance (ISR) platforms in support of defeat-ISIS and National Defense Strategy (NDS) peer/near peer competitor strategy. Maven also brings AI to Captured Enemy Material (CEM), Acoustical Intelligence (ACINT), Overhead Persistent Infrared program (OPIR) and Public Available Information (PAI) exploitation. Maven uses AI, deep learning, and computer vision algorithms to detect, classify, and track objects within FMV images (e.g., person, vehicle, and weapon) and other AI algorithms for CEM and text based projects. Maven algorithms increase the intelligence value of ISR, reduce the human burden of screening so analysts can multi-task increasing productivity, and seeds the generation of insight from Geospatial Intelligence (GEOINT). Project Maven is a commercial technology initiative that inserts commercial AI into existing programs of records. Most military intelligence exploitation systems were designed pre-AI and require specialized integration to enable the insertion of algorithms into their software baseline. Project Maven is the pathfinder AI initiative for the DoD and is investing in critical AI architecture to support the rapid expansion of AI to other mission areas besides GEOINT. As Maven algorithms increase in capability, the algorithms will move to the edge (on the sensor platform).

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 0.000 | 221.235 | 45.261 | - | 45.261 |
| Current President's Budget | 0.000 | 221.235 | 0.000 | - | 0.000 |
| Total Adjustments | 0.000 | 0.000 | -45.261 | - | -45.261 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | - | - | | | |
| • Departmental Adjustment | - | - | -45.261 | - | -45.261 |

**Change Summary Explanation**

Funds are transferred from BA-6 to BA-8 Software and Digital Technology Pilot programs.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 6 | R-1 Program Element (Number/Name)<br>PE 0307588D8Z / *Algorithmic Warfare Cross Functional Team (AWCFT)* | Project (Number/Name)<br>590 / *Algorithmic Warfare Cross Functional Team (AWCFT)* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 590: *Algorithmic Warfare Cross Functional Team (AWCFT)* | 0.000 | 0.000 | 221.235 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 221.235 |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

Algorithmic Warfare Cross Functional Team funds Project Maven which fields increasing amounts of automation to FMV ground exploitation stations for TUAVs, Medium Altitude, High Altitude ISR platforms and accelerates the development and deployment of AI capabilities across the Defense Intelligence Enterprise, including exploitation of CEM, ACINT, OPIR and PAI exploitation. Maven uses artificial intelligence, deep learning, and computer vision algorithms to detect, classify, and track objects within FMV images (e.g., person, vehicle, and weapon) and other AI algorithms for CEM and text based projects. Maven algorithms increase the intelligence value of ISR, reduce the human burden of screening so analysts can multi-task increasing productivity, and seeds the generation of insight from GEOINT. Project Maven is a commercial technology initiative that inserts commercial AI into existing programs of records. Most military intelligence exploitation systems were designed pre-AI and require specialized integration to enable the insertion of algorithms into their software baseline. Project Maven is the pathfinder AI initiative for the DoD and is investing in critical AI architecture to support the rapid expansion of AI to other mission areas besides GEOINT. As Maven algorithms increase in capability, the algorithms will move to the edge (on the sensor platform).

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Algorithmic Warfare Cross Functional Team (AWCFT) | 0.000 | 221.235 | 0.000 |

***Description:*** AWCFT funds Project Maven, a rapid fielding AI program to augment and automate PED for FMV of TUAVs, Medium Altitude, High Altitude, and WAMI ISR platforms in support of defeat-ISIS and NDS peer/near peer competitor strategy. Maven also brings AI to CEM, ACINT, OPIR and PAI exploitation. Maven uses artificial intelligence, deep learning, and computer vision algorithms to detect, classify, and track objects within FMV images (e.g., person, vehicle, and weapon) and other AI algorithms for CEM and text based projects. Maven algorithms increase the intelligence value of ISR, reduce the human burden of screening so analysts can multi-task increasing productivity, and seeds the generation of insight from GEOINT. Project Maven is a commercial technology initiative that inserts commercial AI into existing programs of records. Most military intelligence exploitation systems were designed pre-AI and require specialized integration to enable the insertion of algorithms into their software baseline. Project Maven is the pathfinder AI initiative for the DoD and is investing in critical architecture to support the rapid expansion of AI to other mission areas besides GEOINT. As Maven algorithms increase in capability, the algorithms will move to the edge (on the sensor platform).

***FY 2020 Plans:***

Project Maven uses rapid prototype sprints to field increasing amounts of automation to FMV ground exploitation stations for TUAVs, Medium Altitude, High Altitude and WAMI ISR platforms and accelerate the development and deployment of AI

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 6 | **R-1 Program Element (Number/Name)**<br>PE 0307588D8Z / *Algorithmic Warfare Cross Functional Team (AWCFT)* | **Project (Number/Name)**<br>590 / *Algorithmic Warfare Cross Functional Team (AWCFT)* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| capabilities across the Defense Intelligence Enterprise, including exploitation of CEM, ACINT,OPIR and PAI exploitation Maven will continue to use artificial intelligence, deep learning, and computer vision algorithms to detect, classify, and track objects within FMV images (e.g., person, vehicle, and weapon) and other AI algorithms for CEM and text based projects. This initiative brings artificial intelligence, deep learning, and computer vision into the process of object detection, identification, and tracking at computer process speed versus human speed. Incorporating computer vision and algorithms will reduce the human burden and provide efficient and effective exploration of data. Project Maven plans to develop algorithms focused on tactical UAV FMV Automatic Target Recognition (ATR) and an operational PED environment for platforms and ground stations. AW will build capabilities, integrate AI and ML to provide actionable intelligence and enhancement to military decision-making by providing algorithms for object detection, classification and user alerts.<br>***FY 2021 Plans:***<br>N/A<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funds are transferred from BA-6 to BA-8 Software and Digital Technology Pilot programs. | | | |
| **Accomplishments/Planned Programs Subtotals** | 0.000 | 221.235 | 0.000 |

**C. Other Program Funding Summary ($ in Millions)**

| Line Item | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|
| • O&M PE0307588D8Z: *Algorithmic Warfare Cross Functional Team (AWCFT)* | 0.000 | 11.825 | 4.993 | - | 4.993 | 4.993 | 4.993 | 4.993 | 4.993 | Continuing | Continuing |
| • PROC PE0307588D8Z: *Algorithmic Warfare Cross Functional Team (AWCFT)* | 0.000 | 8.206 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 8.206 |

**Remarks**

**D. Acquisition Strategy**

AWCFT's contracting strategy follows guidance outlined in the DoD 5000 series directives, Federal Acquisition Regulation (FAR), Defense Federal Acquisition Regulation (DFAR) and rapid prototyping policies and procedures. Management uses project management tools and meetings to ensure delivery of stated capabilities and performance criteria are achieved.

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support* | **R-1 Program Element (Number/Name)**<br>PE 0909999D8Z / *Financing for Cancelled Account Adjustments* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 4.836 | 0.969 | 0.000 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| 945: *Financing for Cancelled Account Adjustments* | 4.836 | 0.969 | 0.000 | 0.000 | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

RDT&E Management Support. Financing for cancelled accounts adjustments.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 0.000 | 0.000 | 0.000 | - | 0.000 |
| Current President's Budget | 0.969 | 0.000 | 0.000 | - | 0.000 |
| Total Adjustments | 0.969 | 0.000 | 0.000 | - | 0.000 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | 0.969 | - | | | |
| • SBIR/STTR Transfer | - | - | | | |

**Change Summary Explanation**

Funds reprogrammed in support of cancelled accounts during the year of execution.

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Cancelled or Closed Account Adjustments | 0.969 | - | - |
| ***Description:*** This project funds closed and cancelled accounts. Reprogramming of current / execution year funding accommodates this account. | | | |
| **Accomplishments/Planned Programs Subtotals** | 0.969 | - | - |

**D. Other Program Funding Summary ($ in Millions)**

N/A

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 6: *RDT&E Management Support* | **R-1 Program Element (Number/Name)**<br>PE 0909999D8Z *I Financing for Cancelled Account Adjustments* |

**D. Other Program Funding Summary ($ in Millions)**

**Remarks**

**E. Acquisition Strategy**

N/A

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 7: *Operational Systems Development* | **R-1 Program Element (Number/Name)**<br>PE 0607210D8Z / *Industrial Base Analysis and Sustainment Support* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 77.760 | 48.383 | 104.051 | 9.151 | - | 9.151 | 9.896 | 10.627 | 10.146 | 10.845 | Continuing | Continuing |
| 819: *Industrial Base Analysis and Sustainment* | 77.760 | 48.383 | 104.051 | 9.151 | - | 9.151 | 9.896 | 10.627 | 10.146 | 10.845 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**Note**

Format is changed from previous submissions to produce an R-2 long versus R-2 Plus R-2a.

**A. Mission Description and Budget Item Justification**

The IBAS mission is to strengthen the posture and readiness of the U.S. Defense Manufacturing and Industrial Base to respond at will to national security needs. Industrial Base Analysis and Sustainment (IBAS) Support was established in accordance with 10 USC Sec 2508 Industrial Base Fund direction to strengthen the posture of the U.S. Defense Manufacturing and Industrial Base to respond at will in support of the Warfighter today and tomorrow. The IBAS Program provides the Department with a unique capability to achieve the strategic aims of the 2018 National Defense Strategy calling for a strong, resilient, responsive and healthy U.S. Industrial Base (IB) that underpins current and future U.S. force readiness. This program is uniquely positioned to improve the U.S. Industrial Base's competitiveness and ability to respond to the Department's needs by applying focused investments to 1) monitor and assess the current state of the IB, 2) address critical issues in the IB relating to Urgent Operational Needs, 3) address supply chain vulnerabilities, and 4) support efforts to expand the Industrial Base.

Manufacturing dominance underpins technical dominance. IBAS is fundamental to achieving a modern IB that integrates traditional and emerging sectors to be able to respond at will to National Security Requirements. A healthy manufacturing and defense industrial base and resilient supply chains are essential to the economic strength and national security of the United States. The ability of the United States to maintain readiness, and to surge and sustain in response to an emergency, directly relates to the capacity, capabilities, and resiliency of our manufacturing and defense industrial base and supply chains.

IBAS investments focus on addressing Industrial Base issues that support defense needs by identifying and closing gaps in defense manufacturing capabilities and creating and sustaining reliable sources. Key areas of IBAS investment will include:1) Continue advancement and sustainment of both traditional and emerging defense manufacturing sectors; 2) Continue preservation of critical and unique manufacturing and design skills; 3) Continue the support and expansion of reliable sources; and 4) Continue Identification and mitigation of supply chain vulnerabilities

The IBAS program has a multi-pronged approach to identify projects: 1) assessments of the national technology and industrial base by the OUSD Acquisition & Sustainment (A&S), Office of Industrial Policy (INDPOL) as directed by 10 U.S. Code 2505, 2) working directly in partnership with defense programs, and 3) working directly with industry. INDPOL collaborates with the services and agencies in performing assessments under the Title 10 USC Section 2505 program to identify elements of the industrial base critical to a healthy and resilient defense industrial base in order to address: 1) Gaps in national-security-related domestic manufacturing capabilities; 2) Threatened, single, or sole source capabilities especially within the lower tiers; 3) Foreign Dependency from high risk sources or countries; and 4) Education and manufacturing workforce skills needs

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 7: *Operational Systems Development* | **R-1 Program Element (Number/Name)**<br>PE 0607210D8Z *I Industrial Base Analysis and Sustainment Support* |

FY 2020 and beyond investment strategies will also be informed by findings from 1) Executive Order (EO) 13806 report, "Assessing and Strengthening the Manufacturing and Defense Industrial Base and Supply Chain Resiliency of the United States" and 2) follow-on industrial base and technology assessments. The EO assessment identified nearly 300 risks across 16 sectors; concludes the current state and trajectory of the U.S. industrial base and our capacity to support readiness is in question; and requires significant changes including increased investment for the industrial base.

Cornerstone Other Transaction Agreement (OTA): Enhanced efficiency of IBAS program execution will be supported by a new non-Federal Acquisition Regulation (FAR) OTA procurement vehicle called Cornerstone, established in February 2018 in partnership between the Office of Deputy Assistant Secretary of Defense ODASD (Industrial Policy) and the Army Futures Command, Combat Capabilities Development Command (CCDC) Chemical Biological Center (CBC). Cornerstone was specifically designed for industrial base investments to meet the Departments needs to improve readiness and sustainment through proactive engagement and investment within and across supply chains. Cornerstone provides the ability to access 19 different industry sectors under one agreement where all parties have agreed to one common management agreement and one intellectual property agreement, and it allows the Government to open or direct solicit tasks as legally appropriate against OTA statues. Cornerstone's period of performance is "in perpetuity" with no overall ceiling, with task award ceilings. IBAS authorities coupled with Cornerstone enable the department to efficiently execute IBAS investments – positioning the industrial base to modernize at pace with our military.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 10.376 | 10.051 | 10.129 | - | 10.129 |
| Current President's Budget | 48.383 | 104.051 | 9.151 | - | 9.151 |
| Total Adjustments | 38.007 | 94.000 | -0.978 | - | -0.978 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | 38.500 | 94.000 | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | -0.374 | - | | | |
| • FFRDC | -0.111 | - | - | - | - |
| • Other Program Adjustments | -0.008 | - | -0.289 | - | -0.289 |
| • Defense Wide Review | - | - | -0.689 | - | -0.689 |

| Congressional Add Details ($ in Millions, and Includes General Reductions) | FY 2019 | FY 2020 |
|---|---|---|
| **Project:** 819: *Industrial Base Analysis and Sustainment* | | |
| Congressional Add: *General Increase* | 3.500 | 10.000 |
| Congressional Add: *Expand Manufacturing Capability for Cold Rolled Aluminum* | 10.000 | - |
| Congressional Add: *Large Scale Classified Electron Beam Welding (EBW)* | 15.000 | - |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 7: *Operational Systems Development* | **R-1 Program Element (Number/Name)**<br>PE 0607210D8Z / *Industrial Base Analysis and Sustainment Support* |

| Congressional Add Details ($ in Millions, and Includes General Reductions) | FY 2019 | FY 2020 |
|---|---|---|
| Congressional Add: *Risk Reduction for Tungsten Defense Products* | 10.000 | - |
| Congressional Add: *Submarine Workforce Development* | - | 8.000 |
| Congressional Add: *Manufacturing Engineering* | - | 12.500 |
| Congressional Add: *Advanced Armor Piercing Penetrator* | - | 12.000 |
| Congressional Add: *Lead-free Electronics* | - | 5.000 |
| Congressional Add: *Precision Optics Manufacturing* | - | 7.500 |
| Congressional Add: *Machine and advanced manufacturing* | - | 20.000 |
| Congressional Add: *Automated textile manufacturing* | - | 9.000 |
| Congressional Add: *Interdisciplinary center for advanced manufacturing systems* | - | 5.000 |
| Congressional Add: *Rare Earth Elements from Coal Ash* | - | 5.000 |
| Congressional Add Subtotals for Project: 819 | 38.500 | 94.000 |
| Congressional Add Totals for all Projects | 38.500 | 94.000 |

**Change Summary Explanation**

The FY 2021 funding request was reduced by $0.689 million as a result of the Defense Wide Review, which focused on the Secretary's guidance to streamline operations, increase efficiency, and promote greater affordability within the OSD and Defense Agencies and Field Activities in order to ensure the Department's optimum alignment to the National Defense Strategy and DoD strategic guidance, with particular focus on building a more lethal, resilient, agile, and ready force while strengthening alliances, prioritizing cyber and space capabilities, and focusing on innovation to maintain the technological advantage."

An additional $0.289 million dollars of FY 2021 funding was re-aligned to support planned program changes within the Office of the Under Secretary of Defense Acquisition and Sustainment OUSD(A&S).

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| ***Title:*** Industrial Base Analysis and Sustainment Support (core program, excludes Congressional Adds) | 9.883 | 10.051 | 9.151 | 0.000 | 9.151 |
| ***Description:*** IBAS currently focuses efforts and investments in the four categories listed below:<br>1) Supply Chain Vulnerabilities Mitigation: Findings from the Executive Order (EO) 13806 assessment for both traditional defense sectors and cross-cutting sectors will inform this effort including supply chain issues for ships and subs, casting and forgings, workforce skills for the trades including welding and machining, and machine tools. | | | | | |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 7: *Operational Systems Development* | **R-1 Program Element (Number/Name)**<br>PE 0607210D8Z / *Industrial Base Analysis and Sustainment Support* |

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| 2) Radars, Sensors, and Electronics Sectors: Investments will improve production process efficiencies, explore modular and scalable technology, and upgrade outdated radar and sensor technology.<br>3) Materials Sector: Efforts will address the technical risk associated with the dependence on materials from foreign non allied countries for DoD ground, air, and space assets.<br>4) Munitions and Missiles Sector: Efforts will improve existing production processes, exploring advanced materials for higher performance, and upgrading outdated technology for missile components.<br><br>***FY 2020 Plans:***<br>1) Supply Chain Vulnerabilities Mitigation:<br>1a) Manufacturing Skills Challenge (MSC): This effort across multiple fiscal years starting in FY 2017 is a collaboration among OSD, industry and academia (Universities and Community Colleges). Similar to broad-based Science, Technology, Engineering and Math (STEM) efforts, MSC is comprised of an expanding set of competitions that will help prototype longer-term development of manufacturing training and education models that: 1) promote the prestige of manufacturing and inspire individuals, 2) can be regionally and nationally integrated, 3) close critical gaps in industrial capabilities, and 4) ultimately increase industrial base and defense readiness. The efforts funded with FY 2017, FY 2018 and FY 2020 resources focused on the welding, metrology, machining workforce in regional corridors with defense supply chains including Mississippi, Louisiana, Alabama, South Carolina, Illinois, New York, Texas, Virginia, and Tennessee where large ship, aerospace, and automotive growth have created serious workforce skills and supply chain challenges. This effort includes competitions with "support for a prize." FY 2020 focused on completing state- and invitational-level competitions, hosting four regional competitions, and concluding with a national championship.<br><br>2) Radars, Sensors and Electronics Sector:<br>2a) Radar Affordability: This is a continuing multi-year effort started in 2016. FY 2020 focuses on harmonizing cross-service system requirements and creating detailed system engineering models within the open and modular architectures to enable the DoD to leverage small to medium size companies in defense and in adjacent industrial markets to improve overall DoD radar supplier resiliency.<br><br>2b) Unmanned Systems Affordability : Continues effort initiated in FY 2018. Establish efforts that will develop and assure open and modular product architectures for Radio Frequency (RF), Electro-Optic (EO), and Infrared (IR) sensors, and for power and electric propulsion systems in UAS systems/platforms. | | | | | |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 7: *Operational Systems Development* | **R-1 Program Element (Number/Name)**<br>PE 0607210D8Z / *Industrial Base Analysis and Sustainment Support* |

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| 2c) Directed Energy (DE) Supply Chain Assurance: Continued efforts initiated in FY 2018. Convene cross-service working group to identify supply chain requirements for meeting service program milestone requirements, assessing and prioritizing risks for mitigation strategies.<br><br>3) Materials Sector<br>3a) Boron Carbide: Continue efforts initiated in FY 2019 to: 1) develop a United States (U.S.) source; 2) qualify the U.S. B4C material into a program of record (body armor); 3) develop a second U.S. source to provide competition and surge capability; and 4) to begin systematically qualifying both U.S. sources across multiple systems.<br><br>3b) Heavy Rare Earth Elements (HREE) Supply Chain Resiliency. Continue efforts initiated in FY 2019 as an emergent requirement, not addressed in PB 2020. Executive Orders (E.O.) 13806 and 13817 identified critical materials such as rare earths and components reliant upon rare earths as potential strategic vulnerabilities to the DoD and U.S. Commercial industrial bases. Currently, China has a near global monopoly on rare earths. This initiative is a critical element within the DoD's broader rare earths supply chain risk mitigation plan. It aligns with the Defense Logistics Agency (DLA) Strategic Materials and OSD assessment on HREE. The overall strategy is a systems engineering approach to systematically identify and mitigate risks within the rare earth supply chain and further develop domestic HREE manufacturing processes, ensuring critical component availability and continuity across the material lifecycle. FY2020 assessed Phase 0 studies for viability of domestic capability.<br><br>4) Munitions Sector<br>4a) Fuze Initiatives: Continues program management and oversight of Electronic Safe and Arm Device (ESAD) multi-year efforts initiated in FY 2015 and still in FY 2019 contract execution to mitigate a supply chain loss caused by a reduction in non-DoD demand. | | | | | |
| ***FY 2021 Base Plans:***<br>1) Supply Chain Vulnerabilities Mitigation:<br>1a) Manufacturing Skills Challenge (MSC): Continues efforts initiated in FY 2017 and continuing through FY 2020, as described above under FY 2020 plans. FY 2021 plans will include expanding state-level competitions to additional mid-west, southeast, and northeast states; increase complexity to include additive/hybrid manufacturing processes. | | | | | |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 7: *Operational Systems Development* | **R-1 Program Element (Number/Name)**<br>PE 0607210D8Z / *Industrial Base Analysis and Sustainment Support* |

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| 1b) Industrial Skills Development and Acceleration: these efforts in FY 2021 and continuing for multiple future fiscal years build on the Manufacturing Skills Challenge efforts outlined previously above, and are now characterized in the IBAS program as a “national imperative” to build a sufficient core of industrial skills across the defense and national industrial base. Multiyear efforts to partner with industry and universities to prototype and expand training development pipelines that accelerate entrance into and out of the pipeline for critical Defense critical industrial workforce skills including welding, specialty welding, metrology, and machinists.<br><br>2) Radars, Sensors and Electronics Sector:<br>2a) Radar Affordability: This is a continuing multi-year effort started in 2016. FY 2021 continues efforts addressed above under FY 2020 plans.<br><br>2b) Directed Energy Supply Chain Assurance: Efforts initiated in FY 2018. FY 2021 continues efforts addressed above under FY 2020 plans. FY 2021 activities include developing mitigation and investment strategies, harmonizing service requirements for DE fielding and identifying subcomponents for development common standards and processes to enable a more robust supply chain.<br>***FY 2021 OCO Plans:***<br>NA<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Net decrease of $0.900 million reflects Defense Wide Review adjustments and planned program changes within the Office of the Under Secretary of Defense Acquisition and Sustainment OUSD(A&S). | | | | | |
| **Accomplishments/Planned Programs Subtotals** | 9.883 | 10.051 | 9.151 | 0.000 | 9.151 |

| | FY 2019 | FY 2020 |
|---|---|---|
| ***Congressional Add:*** General Increase | 3.500 | 10.000 |
| ***FY 2019 Accomplishments:*** General Increase was applied to Silicon Interposer microelectronics requirement. Contracted efforts will establish a prototype process to establish Advanced System Integration and Packaging (ASIP) of copper-based silicon interposer technology, making the technology available to the U.S. industrial | | |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 7: *Operational Systems Development* | **R-1 Program Element (Number/Name)**<br>PE 0607210D8Z / *Industrial Base Analysis and Sustainment Support* |

| | FY 2019 | FY 2020 |
|---|---|---|
| base, using U.S. based facilities. The minimum implementation requirements for the prototype will include a silicon bridge interposer and a digital high density interconnect interposer.<br>***FY 2020 Plans:*** Will be applied to requirements including microelectronics, tools development, additional workforce, casting and forgings, munitions and missiles, critical materials, and other Executive Order (EO) 13806 emergent requirements identified through on-going studies. | | |
| ***Congressional Add:*** Expand Manufacturing Capability for Cold Rolled Aluminum<br>***FY 2019 Accomplishments:*** Optimize the manufacturing processes for aluminum armor alloys that are enabled by cold mill upgrades, which include dynamic shape rolling, non-contact shape measurement, automatic gauge, profile and flatness controls. The enhanced and upgraded cold mill will rapidly prototype aluminum armor manufacturing processes that not only optimize quality and throughput, but examine and mature processes to prototype mill products that enable more cost efficient downstream processing. | 10.000 | - |
| ***Congressional Add:*** Large Scale Classified Electron Beam Welding (EBW)<br>***FY 2019 Accomplishments:*** Currently large volume EBW is only available at a foreign source. This effort seeks to establish a U.S. capability via a phased approach, which includes: welding process development, small scale prototype demonstrations, acquisition, installation and commissioning of large scale capable equipment, and full-scale prototype demonstration. EBW enables significant cost, schedule, and quality benefits over traditional, domestically available arc welding technologies. | 15.000 | - |
| ***Congressional Add:*** Risk Reduction for Tungsten Defense Products<br>***FY 2019 Accomplishments:*** Defense applications for tungsten range widely from consumables such as ammunition, bombs, and missiles to critical components in radar, communication equipment, tungsten carbide tooling inserts and ferrotungsten used in the production of super alloys in jet turbines. Several DoD programs have a supply chain vulnerability of either one domestic source or only foreign owned sources for tungsten. This effort seeks to reduce risk and enhance the U.S. capability to produce tungsten through critical modernization investments in areas that support DoD, improve quality and efficiency, and increase overall capacity. | 10.000 | - |
| ***Congressional Add:*** Submarine Workforce Development<br>***FY 2020 Plans:*** Public private partnership with States mitigating shortfalls within the submarine supply chain. | - | 8.000 |
| ***Congressional Add:*** Manufacturing Engineering<br>***FY 2020 Plans:*** Workforce development pipelines for engineering and critical technicians. | - | 12.500 |
| ***Congressional Add:*** Advanced Armor Piercing Penetrator | - | 12.000 |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 7: *Operational Systems Development* | **R-1 Program Element (Number/Name)**<br>PE 0607210D8Z / *Industrial Base Analysis and Sustainment Support* |

| | FY 2019 | FY 2020 |
|---|---|---|
| ***FY 2020 Plans:*** Improve tungsten penetrator production efficiencies and capacities for munitions. | | |
| ***Congressional Add:*** Lead-free Electronics<br>***FY 2020 Plans:*** Establish standards to mitigate risk associated with lead-free electronics. | - | 5.000 |
| ***Congressional Add:*** Precision Optics Manufacturing<br>***FY 2020 Plans:*** Advancing precision optics manufacturing capability and workforce development pipelines. | - | 7.500 |
| ***Congressional Add:*** Machine and advanced manufacturing<br>***FY 2020 Plans:*** Advance machine tools capabilities for DoD specific applications; lower the barrier to entry for small and medium manufacturers to adopt new machine tool capabilities; workforce development. | - | 20.000 |
| ***Congressional Add:*** Automated textile manufacturing<br>***FY 2020 Plans:*** Integrate automated manufacturing capability with high end advanced fibers. | - | 9.000 |
| ***Congressional Add:*** Interdisciplinary center for advanced manufacturing systems<br>***FY 2020 Plans:*** Lower the barriers for entry to small and medium manufacturers to adopt digital and Internet of Things (IOT) 4.0 capabilities. | - | 5.000 |
| ***Congressional Add:*** Rare Earth Elements from Coal Ash<br>***FY 2020 Plans:*** Prototyping rare earth elements extraction from coal ash. | - | 5.000 |
| **Congressional Adds Subtotals** | 38.500 | 94.000 |

**D. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

NA

**E. Acquisition Strategy**

NA

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 7 | **R-1 Program Element (Number/Name)**<br>PE 0607210D8Z / *Industrial Base Analysis and Sustainment Support* | **Project (Number/Name)**<br>819 / *Industrial Base Analysis and Sustainment* | |

**Product Development ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| IBAS Sectors | C/Various | various : various | 70.427 | 7.877 | Dec 2019 | 6.075 | Dec 2020 | 4.764 | Dec 2021 | - | | 4.764 | Continuing | Continuing | - |
| E-Beam Propulsion Initiative - Cong Add | C/FFP | Dynetics Technical Solutions : Huntsville, AL | - | 14.674 | Mar 2019 | - | | - | | - | | - | 0.000 | 14.674 | - |
| Cold Rolled Aluminum - Cong Add | C/FFP | Costellium Rolled Products : Ravenswood WV | - | 9.454 | Oct 2019 | - | | - | | - | | - | 0.000 | 9.454 | - |
| Cold Rolled Aluminum Technical, Ballistic and Blast Testing of Prototype Armor Plate - Cong Add | MIPR | Army Research Laboratory : Aberdeen Proving Ground, MD | - | 0.500 | Dec 2018 | - | | - | | - | | - | 0.000 | 0.500 | - |
| Risk Reduction for Tungsten Defense Products - Cong Add | C/FFP | INSITECH INC : Warren NJ | - | 4.257 | Oct 2019 | - | | - | | - | | - | 0.000 | 4.257 | - |
| Risk Reduction for Tungsten Defense Products - Cong Add | C/FFP | Global Tungsten and Powders Corp : Towanda PA | - | 4.234 | | - | | - | | - | | - | 0.000 | 4.234 | - |
| Risk Reduction for Tungsten Def Products - Sintering Equipment - Cong Add | C/FFP | Thermal Technologies : Santa Rosa CA | - | 0.548 | Sep 2019 | - | | - | | - | | - | 0.000 | 0.548 | - |
| Tungsten Sintering Equipment Technical and Engineering Support - Cong Add | MIPR | Army CCDC Armaments Center : Picatinny, NJ | - | 0.950 | | - | | - | | - | | - | 0.000 | 0.950 | - |
| Silicon Interposer | C/FFP | JCAMB Inc BRIDG : Kissimmee, FL | - | 3.200 | Oct 2019 | - | | - | | - | | - | 0.000 | 3.200 | - |
| Silicon Interposer DoD Product Development Technical Oversite | MIPR | Navy - NSWC Crane : Crane IN | - | 0.075 | Apr 2019 | - | | - | | - | | - | 0.000 | 0.075 | - |
| FY 2020 Congressional Adds Total - planning of efforts beginning | C/FFP | Planning : Planning | - | - | | 94.000 | Sep 2020 | - | | - | | - | 0.000 | 94.000 | - |
| | | **Subtotal** | 70.427 | 45.769 | | 100.075 | | 4.764 | | - | | 4.764 | Continuing | Continuing | N/A |

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 7 | **R-1 Program Element (Number/Name)**<br>PE 0607210D8Z / *Industrial Base Analysis and Sustainment Support* | **Project (Number/Name)**<br>819 / *Industrial Base Analysis and Sustainment* | |

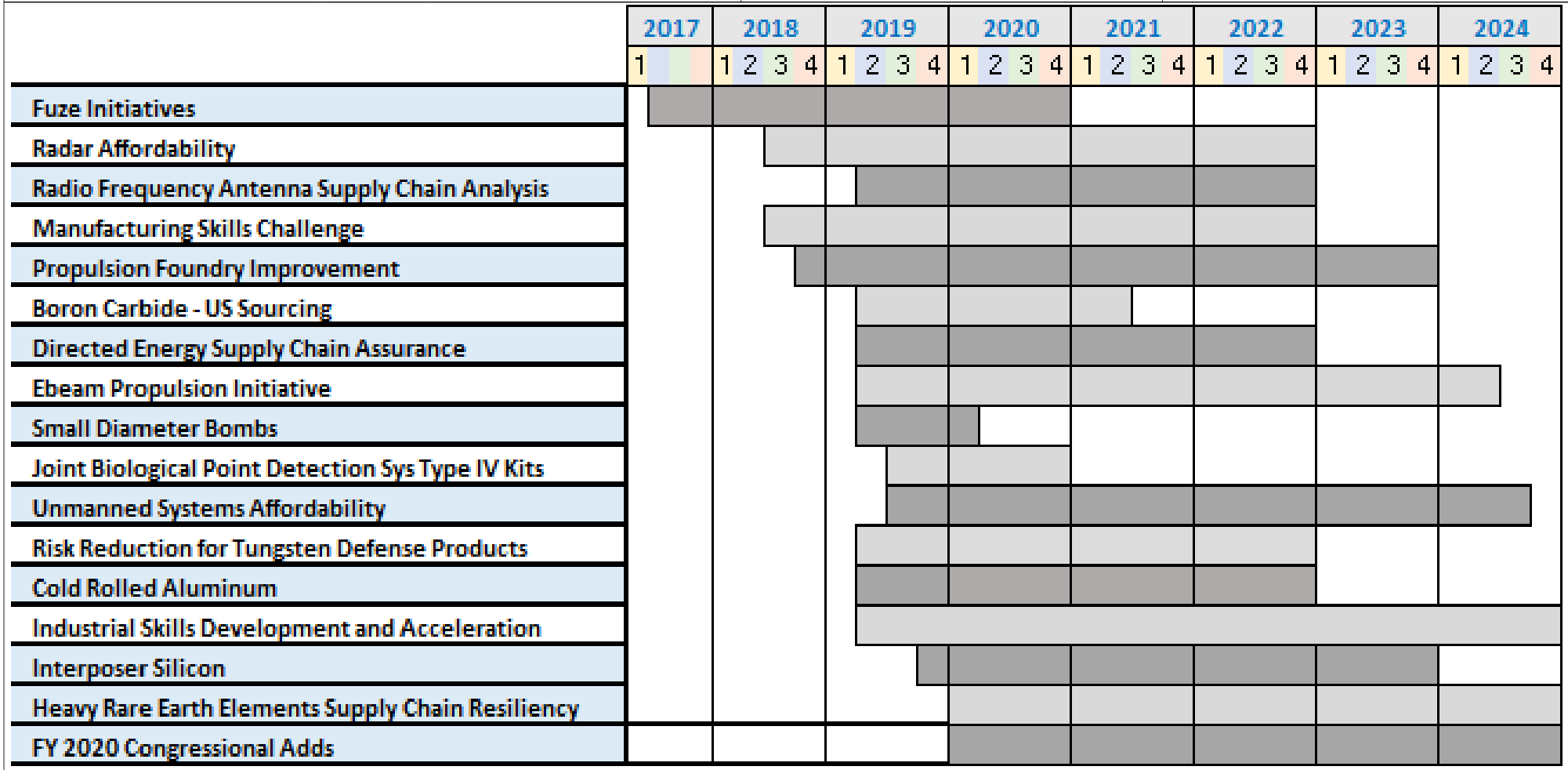
**Management Services ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| OSD SETA support plus Army/Navy Program Management support | Various | various : various | 7.333 | 2.614 | Oct 2018 | 3.976 | Oct 2019 | 4.387 | Oct 2020 | - | | 4.387 | Continuing | Continuing | - |
| | | **Subtotal** | 7.333 | 2.614 | | 3.976 | | 4.387 | | - | | 4.387 | Continuing | Continuing | N/A |

| | Prior Years | FY 2019 | | FY 2020 | | FY 2021 Base | | FY 2021 OCO | | FY 2021 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | 77.760 | 48.383 | | 104.051 | | 9.151 | | - | | 9.151 | Continuing | Continuing | N/A |

**Remarks**

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 7 | **R-1 Program Element (Number/Name)**<br>PE 0607210D8Z / *Industrial Base Analysis and Sustainment Support* | **Project (Number/Name)**<br>819 / *Industrial Base Analysis and Sustainment* |



| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 7 | **R-1 Program Element (Number/Name)**<br>PE 0607210D8Z / *Industrial Base Analysis and Sustainment Support* | **Project (Number/Name)**<br>819 / *Industrial Base Analysis and Sustainment* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***All Sectors*** | | | | |
| Fuze Initiatives | 2 | 2017 | 4 | 2020 |
| Boron Carbide - US Sourcing | 1 | 2019 | 2 | 2021 |
| Radio Frequency Antenna Supply Chain Analysis | 1 | 2019 | 4 | 2022 |
| Directed Energy Supply Chain Assurance | 1 | 2019 | 4 | 2022 |
| Risk Reduction for Tungsten Defense Products | 1 | 2019 | 4 | 2022 |
| Expand Manufacturing Capability for Cold Rolled Aluminum | 1 | 2019 | 4 | 2022 |
| Interposer Silicon | 1 | 2019 | 4 | 2023 |
| E-beam Propulsion Initiative | 1 | 2019 | 2 | 2024 |
| Heavy Rare Earth Elements Supply Chain Resiliency | 3 | 2019 | 1 | 2025 |
| Radar Affordability | 3 | 2018 | 4 | 2025 |
| Industrial Skills Development and Acceleration | 4 | 2019 | 4 | 2025 |
| Manufacturing Skills Challenge | 3 | 2018 | 4 | 2022 |
| Unmanned Systems Affordability | 3 | 2019 | 3 | 2024 |
| FY 2020 Congressional Adds | 1 | 2020 | 4 | 2025 |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 7: *Operational Systems Development* | **R-1 Program Element (Number/Name)**<br>PE 0607310D8Z / *CWMD Systems: Operational Systems Development* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 17.533 | 5.692 | 12.734 | 19.082 | - | 19.082 | 19.288 | 19.477 | 19.629 | 19.820 | Continuing | Continuing |
| 242: *CWMD Systems: Operational System Development* | 17.533 | 5.692 | 12.734 | 19.082 | - | 19.082 | 19.288 | 19.477 | 19.629 | 19.820 | Continuing | Continuing |

**Note**

Increase from FY 2020 to FY 2021 is the result of redistribution of funding from Countering Weapons of Mass Destruction (CWMD) Systems: Advanced Technology Development (PE# 0303310D8Z) to CWMD Systems: System Development and Demonstration (PE# 0305310D8Z) and CWMD Systems: Operational Systems Development (PE# 0607310D8Z). This redistribution supports the Department's need to prioritize investment in fieldable capabilities to enhance Joint Force lethality in countering WMD proliferation and use.

**A. Mission Description and Budget Item Justification**

The Countering Weapons of Mass Destruction (CWMD) Systems portfolio aligns with the National Defense Strategy objective of "dissuading, preventing, or deterring state adversaries and non-state actors from acquiring, proliferating, or using weapons of mass destruction."

The CWMD Systems portfolio enhances warfighter lethality by developing capabilities to analyze and exploit critical nodes of nuclear, chemical, and biological weapons and ballistic missile programs and proliferation networks; and developing offensively-oriented capabilities to disrupt WMD proliferation networks and detect, disable, or defeat WMD and delivery systems. Investments result on capabilities fielded to the Joint Force, enabling it to reduce WMD threats and create options for the United States to prevent WMD use.

The Office of the Secretary of Defense uses the CWMD Systems portfolio to invest strategically in projects across the Military Services, Combatant Commands, and Defense Agencies. Funding is prioritized for projects that close Joint Force warfighter capability gaps. An annual investment strategy is used to meet emergent operational and capability needs submitted by the Joint Force, yielding new fielded capabilities within one to two years.

The CWMD Systems: Operational Systems Development program invests in upgrades of and enhancements to fielded systems that counter WMD proliferation. Funds are used for integration of operational prototypes into fielded systems, or other upgrades and enhancements, including any necessary test and evaluation. Investments modernize existing counter WMD capabilities within the Department of Defense to enhance the Joint Force's lethality by upgrading and enhancing currently fielded systems. Upgraded capabilities illuminate WMD networks; exploit vulnerabilities in networks, programs, facilities, and weapons systems; and disable or defeat WMD.

This appropriation funds labor, materials, and travel to support the requirements of this program, performed by a government agency or by private individuals or organizations under a contract with the government, for activities and acquisitions including RDT&E, assessments and analyses, research studies, education, and other activities related to capability development and fielding.

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 7: *Operational Systems Development* | **R-1 Program Element (Number/Name)**<br>PE 0607310D8Z / *CWMD Systems: Operational Systems Development* |

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 5.902 | 12.734 | 13.209 | - | 13.209 |
| Current President's Budget | 5.692 | 12.734 | 19.082 | - | 19.082 |
| Total Adjustments | -0.210 | 0.000 | 5.873 | - | 5.873 |
| • Congressional General Reductions | 0.000 | - | | | |
| • Congressional Directed Reductions | 0.000 | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | 0.000 | - | | | |
| • Congressional Directed Transfers | 0.000 | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | -0.209 | - | | | |
| • Other Program Adjustments | - | - | 7.495 | - | 7.495 |
| • Cancelled Accounts | -0.001 | - | - | - | - |
| • Economic Assumption | - | - | -0.022 | - | -0.022 |
| • Defense Wide Review Adjustment | - | - | -1.600 | - | -1.600 |

**Change Summary Explanation**

Increase from FY 2020 to FY 2021 is the result of redistribution of funding from Countering Weapons of Mass Destruction (CWMD) Systems: Advanced Technology Development (PE# 0303310D8Z) to CWMD Systems: System Development and Demonstration (PE# 0305310D8Z) and CWMD Systems: Operational Systems Development (PE# 0607310D8Z). This redistribution supports the Department's need to prioritize investment in fieldable capabilities to enhance Joint Force lethality in countering WMD proliferation and use.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 7 | R-1 Program Element (Number/Name)<br>PE 0607310D8Z / *CWMD Systems: Operational Systems Development* | Project (Number/Name)<br>242 / *CWMD Systems: Operational System Development* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 242: *CWMD Systems: Operational System Development* | 17.533 | 5.692 | 12.734 | 19.082 | - | 19.082 | 19.288 | 19.477 | 19.629 | 19.820 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**Note**

Increase from FY 2020 to FY 2021 is the result of redistribution of funding from Countering Weapons of Mass Destruction (CWMD) Systems: Advanced Technology Development (PE# 0303310D8Z) to CWMD Systems: System Development and Demonstration (PE# 0305310D8Z) and CWMD Systems: Operational Systems Development (PE# 0607310D8Z). This redistribution supports the Department's need to prioritize investment in fieldable capabilities to enhance Joint Force lethality in countering WMD proliferation and use.

**A. Mission Description and Budget Item Justification**

The Countering Weapons of Mass Destruction (CWMD) Systems portfolio aligns with the National Defense Strategy objective of "dissuading, preventing, or deterring state adversaries and non-state actors from acquiring, proliferating, or using weapons of mass destruction."

The CWMD Systems portfolio enhances warfighter lethality by developing capabilities to analyze and exploit critical nodes of nuclear, chemical, and biological weapons and ballistic missile programs and proliferation networks; and developing offensively-oriented capabilities to disrupt WMD proliferation networks and detect, disable, or defeat WMD and delivery systems. Investments result on capabilities fielded to the Joint Force, enabling it to reduce WMD threats and create options for the United States to prevent WMD use.

The Office of the Secretary of Defense uses the CWMD Systems portfolio to invest strategically in projects across the Military Services, Combatant Commands, and Defense Agencies. Funding is prioritized for projects that close Joint Force warfighter capability gaps. An annual investment strategy is used to meet emergent operational and capability needs submitted by the Joint Force, yielding new fielded capabilities within one to two years.

The CWMD Systems: Operational Systems Development program invests in upgrades of and enhancements to fielded systems that counter WMD proliferation. Funds are used for integration of operational prototypes into fielded systems, or other upgrades and enhancements, including any necessary test and evaluation. Investments modernize existing counter WMD capabilities within the Department of Defense to enhance the Joint Force's lethality by upgrading and enhancing currently fielded systems. Upgraded capabilities illuminate WMD networks; exploit vulnerabilities in networks, programs, facilities, and weapons systems; and disable or defeat WMD.

This appropriation funds labor, materials, and travel to support the requirements of this program, performed by a government agency or by private individuals or organizations under a contract with the government, for activities and acquisitions including RDT&E, assessments and analyses, research studies, education, and other activities related to capability development and fielding.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 7 | **R-1 Program Element (Number/Name)**<br>PE 0607310D8Z / *CWMD Systems: Operational Systems Development* | **Project (Number/Name)**<br>242 / *CWMD Systems: Operational System Development* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** P*242 / CWMD Systems: Operational Systems Development | 5.692 | 12.734 | 19.082 |
| ***Description:*** The CWMD Systems: Operational Systems Development program invests in upgrades of and enhancements to fielded systems that counter WMD proliferation. Funds are used for integration of operational prototypes into fielded systems, or other upgrades and enhancements, including any necessary test and evaluation. Investments modernize existing counter WMD capabilities within the Department of Defense to enhance the Joint Force's lethality by upgrading and enhancing currently fielded systems. Upgraded capabilities illuminate WMD networks; exploit vulnerabilities in networks, programs, facilities, and weapons systems; and disable or defeat WMD.<br><br>***FY 2020 Plans:***<br>• Upgraded hardware and software systems for the Air Force Technical Applications Center (AFTAC), supporting its mission to monitor nuclear treaty compliance and develop advanced proliferation monitoring technologies.<br>• Upgraded the Unified Command Suite for the National Guard Bureau's WMD Civil Support Teams<br>• Upgraded fielded systems under a number of classified projects, enhancing capabilities to detect, disrupt, and defeat WMD and WMD networks<br>• Completed and transitioned 100% of operational system upgrade projects<br><br>***FY 2021 Plans:***<br>• Upgrade or enhance fielded systems for the Joint Force to detect, disrupt, and defeat WMD and WMD networks. Projects are classified.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Increase from FY 2020 to FY 2021 is the result of redistribution of funding from Countering Weapons of Mass Destruction (CWMD) Systems: Advanced Technology Development (PE# 0303310D8Z) to CWMD Systems: System Development and Demonstration (PE# 0305310D8Z) and CWMD Systems: Operational Systems Development (PE# 0607310D8Z). This redistribution supports the Department's need to prioritize investment in fieldable capabilities to enhance Joint Force lethality in countering WMD proliferation and use. | | | |
| **Accomplishments/Planned Programs Subtotals** | 5.692 | 12.734 | 19.082 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

N/A

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 7 | **R-1 Program Element (Number/Name)**<br>PE 0607310D8Z / *CWMD Systems: Operational Systems Development* | **Project (Number/Name)**<br>242 / *CWMD Systems: Operational System Development* |

**D. Acquisition Strategy**

The Office of the Deputy Assistant Secretary of Defense for Threat Reduction and Arms Control (TRAC) establishes annual priorities based on national and DoD strategies and senior leader guidance. Based on those priorities, TRAC solicits project proposals from Combatant Commands, Military Services, and Defense Agencies, and interagency partners. To be selected, a proposed project must have a validated requirement, an engaged requirement champion, a viable acquisition strategy, and a qualified program management office. A technology project must identify its starting and desired end-state Technology Readiness Level. Likewise, the end-user for any proposed project must demonstrate a long-term plan for acceptance and sustainment of a fieldable capability. Project period of performance is typically 12-18 months.

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 7 | **R-1 Program Element (Number/Name)**<br>PE 0607310D8Z / *CWMD Systems: Operational Systems Development* | **Project (Number/Name)**<br>242 / *CWMD Systems: Operational System Development* |

**Product Development ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Upgrade & enhance Special Operations Forces (SOF) technologies, applications & information systems | MIPR | USSOCOM : TBD | 1.737 | 1.897 | Jan 2019 | 4.245 | Jan 2020 | 6.360 | Jan 2021 | - | | 6.360 | Continuing | Continuing | - |
| Enhance warfighter capability to detect, disable, or defeat WMD | Various | TBD : TBD | 1.736 | 1.897 | Feb 2019 | 4.245 | Feb 2020 | 6.360 | Feb 2021 | - | | 6.360 | Continuing | Continuing | - |
| Enhance Air Force Technical Applications Center (AFTAC) capabilities to support nuclear treaty monitoring and nuclear event detection | MIPR | AFTAC : TBD | 1.736 | 1.898 | Jan 2019 | 4.244 | Jan 2020 | 6.362 | Jan 2021 | - | | 6.362 | Continuing | Continuing | - |
| Upgrade fielded CWMD Systems and components | Various | Various : Various | 12.324 | - | | - | | - | | - | | - | Continuing | Continuing | - |
| | | **Subtotal** | 17.533 | 5.692 | | 12.734 | | 19.082 | | - | | 19.082 | Continuing | Continuing | N/A |

**Remarks**

Increase from FY 2020 to FY 2021 is the result of redistribution of funding from Countering Weapons of Mass Destruction (CWMD) Systems: Advanced Technology Development (PE# 0303310D8Z) to CWMD Systems: System Development and Demonstration (PE# 0305310D8Z) and CWMD Systems: Operational Systems Development (PE# 0607310D8Z). This redistribution supports the Department's need to prioritize investment in fieldable capabilities to enhance Joint Force lethality in countering WMD proliferation and use.

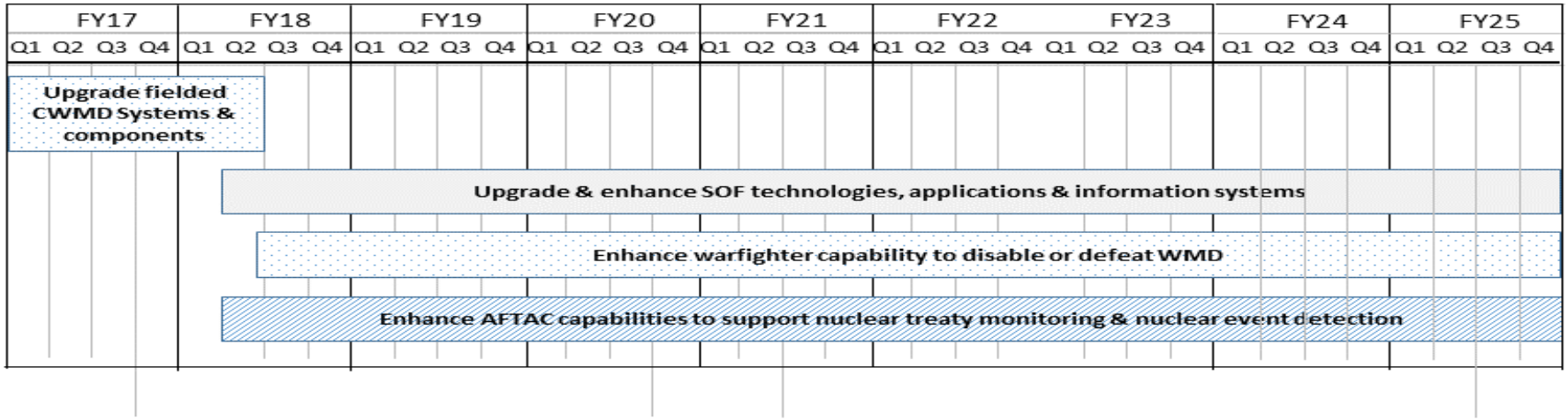
| | Prior Years | FY 2019 | | FY 2020 | | FY 2021 Base | | FY 2021 OCO | | FY 2021 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | 17.533 | 5.692 | | 12.734 | | 19.082 | | - | | 19.082 | Continuing | Continuing | N/A |

**Remarks**

Increase from FY 2020 to FY 2021 is the result of redistribution of funding from Countering Weapons of Mass Destruction (CWMD) Systems: Advanced Technology Development (PE# 0303310D8Z) to CWMD Systems: System Development and Demonstration (PE# 0305310D8Z) and CWMD Systems: Operational Systems Development (PE# 0607310D8Z). This redistribution supports the Department's need to prioritize investment in fieldable capabilities to enhance Joint Force lethality in countering WMD proliferation and use.

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 7 | **R-1 Program Element (Number/Name)**<br>PE 0607310D8Z / *CWMD Systems: Operational Systems Development* | **Project (Number/Name)**<br>242 / *CWMD Systems: Operational System Development* |

**CWMD Systems: Operational System Development**
**BA 7 / PE 0607310D8Z**



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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 7: *Operational Systems Development* | **R-1 Program Element (Number/Name)**<br>PE 0303140D8Z / *Information Systems Security Program* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 57.529 | 17.899 | 67.631 | 46.577 | - | 46.577 | 50.010 | 10.646 | 10.642 | 10.855 | Continuing | Continuing |
| 140: *Information Systems Security Program* | 57.529 | 17.899 | 67.631 | 46.577 | - | 46.577 | 50.010 | 10.646 | 10.642 | 10.855 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

The DoD CIO Information Systems Security Program (ISSP) provides for focused research, development, testing and integration of technology and technical solutions critical to the Defense Cybersecurity and Information Assurance (CS&IA) Program to meet the requirements of 10 USC 2224 (Defense Information Assurance Program), 44 USC 3544, (Federal Information Security Management Act of 2002), OMB Circular A-130, and DoD Directives/Instructions 8500, 8510, 8520, 8530, and 8540. This program is funded under Budget Activity 7, Operational System Development, because it integrates technology and technical solutions to the Defense CS&IA Program.

ISSP RDT&E funds support the DoD CIO and its mission partners: on architecting, engineering, and technical matters for developing governance processes and structures; on evolving and enabling a more integrated and synchronized Joint Information Environment (JIE) to provide the means for more integrated information sharing and collaboration that also endeavors to close identified gaps across all mission areas with a shared network of core enterprise services; on the continued development of the U.S. Government's ability to prevent and defend against adversarial and/or commercial information and communications technology supply-chain attacks on its mission critical systems, networks, and devices; on improving oversight of the life-cycle management of cybersecurity risks; and on the integration of cybersecurity standards, methods, and procedures across the DoD for a more robust and resilient cybersecurity posture.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 17.899 | 67.631 | 56.355 | - | 56.355 |
| Current President's Budget | 17.899 | 67.631 | 46.577 | - | 46.577 |
| Total Adjustments | 0.000 | 0.000 | -9.778 | - | -9.778 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | - | - | | | |
| • DWR | - | - | -5.723 | - | -5.723 |
| • Economic Assumptions | - | - | -0.055 | - | -0.055 |
| • Reduced Level Of Effort | - | - | -4.000 | - | -4.000 |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 7: *Operational Systems Development* | **R-1 Program Element (Number/Name)**<br>PE 0303140D8Z / *Information Systems Security Program* |

**Change Summary Explanation**

FY21: The FY 2021 funding request was reduced by $5.723 million during DWR to account for change in requirements, resulting in a reduced level of effort (classified).

FY21: Defense-Wide Economic Assumptions -$.055 million.

FY21: The FY 2021 funding request was reduced by $4.00 million, resulting in a reduced level of effort.

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Information Systems Security Program Plans and Accomplishments | 17.899 | 67.631 | 46.577 |
| ***FY 2020 Plans:***<br>$56.000 million: Classified Program<br>• Work with industry to develop new technologies that upgrade cybersecurity to current legacy networks and have the potential to evolve into systems that are part of a new cybersecurity architecture and command and control capability.<br><br>$11.631 million:<br>• Support analyses that would develop artificial intelligence (AI) and machine learning to model network behavior and improve cyber threat detection, and AI capabilities that would enhance and potentially transform information security.<br><br>• Continue to develop and refine policies to support strategies for acquisition program protection and oversight. Develop strategies, standards, and tools to address supply chain risk management, and continue to collaborate with private industry for commercially acceptable global sourcing and supply chain standards.<br><br>• Continue to evaluate cyber activities for more efficient mitigation investment decisions, to include metrics focused on the cybersecurity domain, and support for policy development and refinement, policy oversight and formulation of programmatic advice, and participation in various collaborative advisory and governance bodies.<br><br>• Accelerate the means for use of commercial Cloud providers, related Cloud security guidance and procedures by commercial Cloud service providers, and continued refinement and oversight of policies and capabilities to support comprehensive cybersecurity capability for secure mobility processes in the Joint Information Environment.<br><br>• Continue development and engineering support for critical Joint Information architectures, C4I tactical networks, coalition, and mission partner's networks. Support includes implementing the joint information environment single security architecture and strategy, related metrics, analyses, Joint Information Environment Single Security Architecture (SSA) policies, architectures, and capabilities to ensure best value architectural decisions are made early to affect the most impact, while increasing mission and security for the entire DoD enterprise. | | | |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 7: *Operational Systems Development* | **R-1 Program Element (Number/Name)**<br>PE 0303140D8Z / *Information Systems Security Program* |

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| • Continue to develop and implement strategies for successful defenses and operations in the event of sophisticated cyber adversaries and large-scale cyber incidents, to include threat-based system-security-engineering efforts and development of critical design artifacts (threat analyses, risk analyses, system-of- system-security architectures), having demonstrated applications to space systems and mission partner environment (MPE).<br><br>• Support analyses on various aspects of cybersecurity for cloud-based computing for the DoD, applicable risk factors, and continual refinement of mitigation controls as part of the risk management framework regime in support of DoD CIO's goal of accelerating the adoption of cloud computing within the department. Robust and comprehensive Cloud Risk Management will assist the DoD community with addressing security requirements for systems transitioning to the commercial cloud.<br><br>• Continue refinement and integration of policies with the risk management framework (RMF), supportive standards, guidance, efficiencies, and web-based processes to strengthen controls and protections for information systems.<br><br>• Continue to improve mission assurance, mitigation analyses, and vulnerability detection (hardware and software testing) for acquisitions to build-in cybersecurity early (i.e., cybersecurity built in vice bolted on), especially key acquisition programs-of-record (i.e., Major Automated Information Systems; Major Defense Acquisition Programs, and other special interest developmental and acquisition activities). Investments include Program Protection, Systems Engineering, and Acquisition standards.<br>***FY 2021 Plans:***<br>$35.222 million: Classified Program<br>• Work with industry to develop new technologies that upgrade cybersecurity to current legacy networks and have the potential to evolve into systems that are part of a new cybersecurity architecture and command and control capability.<br><br>$11.355 million:<br>• Support analyses that develop artificial intelligence (AI) and machine learning to model network behavior and improve cyber threat detection, and AI capabilities that would enhance and potentially transform information security.<br><br>• Continue to develop and refine policies to support strategies for acquisition program protection and oversight. Develop strategies, standards, and tools to address supply chain risk management, and continue to collaborate with private industry for commercially acceptable global sourcing and supply chain standards.<br><br>• Continue to evaluate cyber activities for more efficient mitigation investment decisions, to include metrics focused on the cybersecurity domain, and support for policy development and refinement, policy oversight and formulation of programmatic advice, and participation in various collaborative advisory and governance bodies. | | | |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 7: *Operational Systems Development* | **R-1 Program Element (Number/Name)**<br>PE 0303140D8Z / *Information Systems Security Program* |

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| • Accelerate the means for use of commercial Cloud providers, related Cloud security guidance and procedures by commercial Cloud service providers, and continued refinement and oversight of policies and capabilities to support comprehensive cybersecurity capability for secure mobility processes in the Joint Information Environment.<br><br>• Continue development and engineering support for critical Joint Information architectures, C4I tactical networks, coalition, and mission partner's networks. Support includes implementing the joint information environment single security architecture and strategy, related metrics, analyses, Joint Information Environment Single Security Architecture (SSA) policies, architectures, and capabilities to ensure best value architectural decisions are made early to affect the most impact, while increasing mission and security for the entire DoD enterprise.<br><br>• Continue to develop and implement strategies for successful defenses and operations in the event of sophisticated cyber adversaries and large-scale cyber incidents, to include threat-based system-security-engineering efforts and development of critical design artifacts (threat analyses, risk analyses, system-of- system-security architectures), having demonstrated applications to space systems and mission partner environment (MPE).<br><br>• Support analyses on various aspects of cybersecurity for cloud-based computing for the DoD, applicable risk factors, and continual refinement of mitigation controls as part of the risk management framework regime in support of DoD CIO's goal of accelerating the adoption of cloud computing within the department. Robust and comprehensive Cloud Risk Management will assist the DoD community with addressing security requirements for systems transitioning to the commercial cloud.<br><br>• Continue refinement and integration of policies with the risk management framework (RMF), supportive standards, guidance, efficiencies, and web-based processes to strengthen controls and protections for information systems.<br><br>• Continue to improve mission assurance, mitigation analyses, and vulnerability detection (hardware and software testing) for acquisitions to build-in cybersecurity early (i.e., cybersecurity built in vice bolted on), especially key acquisition programs-of-record (i.e., Major Automated Information Systems; Major Defense Acquisition Programs, and other special interest developmental and acquisition activities). Investments include Program Protection, Systems Engineering, and Acquisition standards.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>FY 20 funding increased was a classified add. | | | |
| **Accomplishments/Planned Programs Subtotals** | 17.899 | 67.631 | 46.577 |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 7: *Operational Systems Development* | **R-1 Program Element (Number/Name)**<br>PE 0303140D8Z / *Information Systems Security Program* |

**D. Other Program Funding Summary ($ in Millions)**

| Line Item | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|
| • 0303140D8Z O&M DW: *Information System Security Program* | 16.110 | 9.809 | 11.355 | - | 11.355 | 10.655 | 10.857 | 10.857 | 11.074 | Continuing | Continuing |

**Remarks**

**E. Acquisition Strategy**

N/A

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 7 | **R-1 Program Element (Number/Name)**<br>PE 0303140D8Z / *Information Systems Security Program* | **Project (Number/Name)**<br>140 / *Information Systems Security Program* |

**Support ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Studies and Analysis | Option/ Various | Various : Various | 2.667 | 0.936 | Jul 2019 | 1.962 | Jul 2020 | 1.962 | Jul 2021 | - | | 1.962 | Continuing | Continuing | - |
| Technical Engineering Services | Option/ Various | Various : Various | 23.157 | 6.580 | Jul 2019 | 56.000 | Jul 2020 | 35.222 | Jul 2021 | - | | 35.222 | Continuing | Continuing | - |
| Services Support | Option/ Various | Various : Various | 11.086 | 10.000 | Jul 2019 | 0.194 | Jul 2020 | 0.194 | Jul 2021 | - | | 0.194 | Continuing | Continuing | - |
| | | **Subtotal** | 36.910 | 17.516 | | 58.156 | | 37.378 | | - | | 37.378 | Continuing | Continuing | N/A |

**Management Services ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Program Management Support | Option/ Various | Various : Various | 1.681 | 0.155 | Jul 2019 | 0.394 | Jul 2020 | 0.394 | Jul 2021 | - | | 0.394 | Continuing | Continuing | - |
| Engineering Support | Option/ Various | Various : Various | 12.720 | 0.100 | Jul 2019 | 6.923 | Jul 2020 | 6.647 | Jul 2021 | - | | 6.647 | Continuing | Continuing | - |
| Research & Development | Option/ Various | Various : Various | 6.218 | 0.128 | Jul 2019 | 2.158 | Jul 2020 | 2.158 | Jul 2021 | - | | 2.158 | Continuing | Continuing | - |
| | | **Subtotal** | 20.619 | 0.383 | | 9.475 | | 9.199 | | - | | 9.199 | Continuing | Continuing | N/A |

**Remarks**

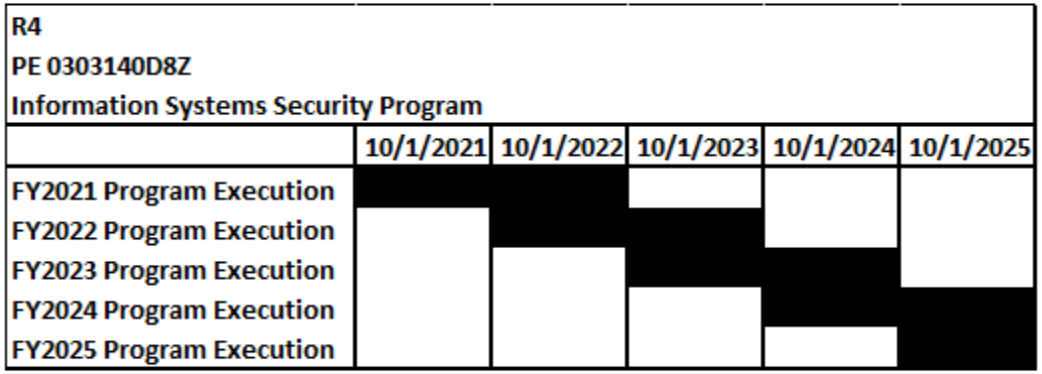
NA

| | Prior Years | FY 2019 | | FY 2020 | | FY 2021 Base | | FY 2021 OCO | | FY 2021 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | 57.529 | 17.899 | | 67.631 | | 46.577 | | - | | 46.577 | Continuing | Continuing | N/A |

**Remarks**

NA

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 7 | **R-1 Program Element (Number/Name)**<br>PE 0303140D8Z / *Information Systems Security Program* | **Project (Number/Name)**<br>140 / *Information Systems Security Program* |



| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 7 | **R-1 Program Element (Number/Name)**<br>PE 0303140D8Z / *Information Systems Security Program* | **Project (Number/Name)**<br>140 / *Information Systems Security Program* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ****** SUBPROJECT TITLE ****** | | | | |
| FY 2021 Projected Execution | 3 | 2021 | 2 | 2022 |
| FY 2022 Projected Execution | 1 | 2022 | 2 | 2023 |
| FY 2023 Projected Execution | 1 | 2023 | 2 | 2024 |
| FY 2024 Projected Execution | 1 | 2024 | 2 | 2025 |
| FY2025 Projected Execution | 1 | 2025 | 4 | 2025 |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 7: *Operational Systems Development* | **R-1 Program Element (Number/Name)**<br>PE 0305186D8Z / *Policy R&D Programs* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 36.161 | 6.122 | 6.301 | 7.144 | 0.000 | 7.144 | 7.329 | 8.313 | 8.446 | 8.699 | Continuing | Continuing |
| 186: *Policy R&D Programs* | 36.161 | 6.122 | 6.301 | 7.144 | 0.000 | 7.144 | 7.329 | 8.313 | 8.446 | 8.699 | Continuing | Continuing |

**Note**

The FY 2021 funding request was increased by $1,008 thousand during DWR to account for reprogramming of funds from OUSD A&S.

**A. Mission Description and Budget Item Justification**

The Policy R&D Program supports the National Defense Strategy by provide analysis to overcome military security challenges. Since the global environment is dynamic, research is necessary for continued understanding military structures, foreign cultures, and ethnic issues. Examines demographic data, investigates future global security challenges, provides insights to inform critical national security decisions, explores ways to build partnership capabilities to counter organizational warfare, develop foreign military infrastructure, and deny sanctuary to extremist groups. Program blends several disciplines including surveillance, operations, policy, information management, cyber policy, training and technology.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 6.190 | 6.301 | 6.367 | 0.000 | 6.367 |
| Current President's Budget | 6.122 | 6.301 | 7.144 | 0.000 | 7.144 |
| Total Adjustments | -0.068 | 0.000 | 0.777 | - | 0.777 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | -0.001 | - | | | |
| • SBIR/STTR Transfer | -0.067 | - | | | |
| • Funding transferred to O&M Labor account PE:0907388D8Z | - | - | -0.223 | - | -0.223 |
| • Change reflects reprogramming of funds from OUSD A&S as a result of the Defense Wide Review. | - | - | 1.008 | - | 1.008 |
| • Inflation adjustment | - | - | -0.008 | - | -0.008 |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 7: *Operational Systems Development* | **R-1 Program Element (Number/Name)**<br>PE 0305186D8Z / *Policy R&D Programs* |

**Change Summary Explanation**

FY 2021 adjustment reflects funds previously funded by OUSD A&S transferred to the OUSD Policy Budget. This change also reflects a decrease in the Policy R&D original funding. Both changes are the result of the Defense Wide Review.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 7 | R-1 Program Element (Number/Name)<br>PE 0305186D8Z / *Policy R&D Programs* | Project (Number/Name)<br>186 / *Policy R&D Programs* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 186: *Policy R&D Programs* | 36.161 | 6.122 | 6.301 | 7.144 | 0.000 | 7.144 | 7.329 | 8.313 | 8.446 | 8.699 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**Note**

Change reflects reprogramming of funds from OUSD A&S as a result of the Defense Wide Review.

**A. Mission Description and Budget Item Justification**

Provide analysis to overcome military security challenges. Since the global environment is dynamic, research is necessary for continued understanding military structures, foreign cultures, and ethnic issues. Examines demographic data, investigates future global security challenges, provides insights to inform critical national security decisions, explores ways to build partnership capabilities to counter organizational warfare, develop foreign military infrastructure, and deny sanctuary to extremist groups. Program blends several disciplines including surveillance, operations, policy, information management, cyber policy, training and technology.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| ***Title:*** Future Security Challenges | 2.536 | 2.643 | 2.720 | 0.000 | 2.720 |
| ***Description:*** Provides program management oversight and technical support to identify current and emerging future security challenges to the Department, and for international cooperation activities with Allies and international partners to confront these challenges. Anticipates exploitation of technology, including available and advanced capabilities, and work with the international commercial sector and academia concerning adversary's application of technology. Program explores processes and policy to integrate international capabilities across the spectrum of security challenges. | | | | | |
| ***FY 2020 Plans:***<br>. Continue FY19 efforts with an emphasis on Defeating ISIS and Asian Maritime activities:<br>. Perform ongoing trend analysis and develop mitigation options for addressing program risks.<br>• Develop opportunities to apply risk management methodologies to identified program areas.<br>• Working with out international partners, develop net-centric enterprise technologies to remove international sharing barriers identified with maritime information, intelligence, and data being collected by DoD and foreign governments<br>• Research military competition among nations in the Far and Middle East and highlight potential capabilities and policies each nation may utilize in future armed conflicts<br>• Continue to enhance strategies and relationships with European nations based on the exchange of information through education opportunities and existing policies | | | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 7 | **R-1 Program Element (Number/Name)**<br>PE 0305186D8Z / *Policy R&D Programs* | **Project (Number/Name)**<br>186 / *Policy R&D Programs* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| • Research and analyze particular Far and Middle East countries as it relates to their decision-making process, financial position, leadership, political dynamics, technical abilities and internal social tensions and stability.<br>• Continue research efforts within the Services and Combatant Commands to better analyze and demonstrate enduring counterinsurgency operational capabilities.<br>***FY 2021 Base Plans:***<br>. Perform ongoing trend analysis and develop mitigation options for addressing program risks with increased emphasis on the INDO-PACOM AOR.<br>• Develop opportunities to apply risk management methodologies to identified program areas.<br>• Working with out international partners, develop net-centric enterprise technologies to remove international sharing barriers<br>identified with maritime information, intelligence, and data being collected by DoD and foreign governments<br>• Research military competition among nations in the Far and Middle East and highlight potential capabilities and policies each<br>nation may utilize in future armed conflicts<br>• Continue to enhance strategies and relationships with European nations based on the exchange of information through<br>education opportunities and existing policies<br>• Research and analyze particular Far (China) and Middle East countries as it relates to their decision-making process, financial position,<br>leadership, political dynamics, technical abilities and internal social tensions and stability.<br>• Continue research efforts within the Services and Combatant Commands to better analyze and demonstrate enduring<br>counterinsurgency operational capabilities.<br>***FY 2021 OCO Plans:***<br>N/A<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The increase supports an added emphasis on developing methodologies and technologies to defeat our adversaries and the creation of the Deputy Assistant Secretary of Defense (DASD) China Office. | | | | | |
| ***Title:*** Long Term Competitions (LTC) Program | 2.886 | 2.958 | 3.724 | 0.000 | 3.724 |
| ***Description:*** Request supports the Long Term Competitions (LTC) program which is an analytical effort chartered to provide the DoD senior leadership with an understanding of key long-term developments and dynamics in specific areas of the global security environment, and to develop competitive strategies for their | | | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 7 | **R-1 Program Element (Number/Name)**<br>PE 0305186D8Z / *Policy R&D Programs* | **Project (Number/Name)**<br>186 / *Policy R&D Programs* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| consideration as the Department seeks to address these long term challenges. The LTC Program will provide rigorously analyzed competitive strategy recommendations to these senior DoD leaders, and will require the support of organizations and experts outside of government to deliver the highest quality analysis, concepts and recommendations. Funding for the LTC program will be used to: bring outside experts into Task Force working groups and strategy review teams; contract studies; support wargaming and workshops; conduct analytical studies of key developments and dynamics, and their impact on the future security environment and U.S. military capabilities in that environment; and explore new approaches to addressing key analytical requirements. Assessments of the ability of future forces to achieve objectives at the campaign level. These assessments include wargaming, qualitative, and quantitative analytic methods. They will both inform and be informed by the Support for Strategic Analysis (SSA) defense planning scenarios (DPS). They will identify risk and potential trade-space among force structure, capabilities, and readiness to inform senior leader decision-making.<br><br>***FY 2020 Plans:***<br>Specific efforts are classified.<br><br>***FY 2021 Base Plans:***<br>Specific efforts are classified.<br><br>***FY 2021 OCO Plans:***<br>N/A<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Increase in funding is the result of funds formerly provided by OUSD A&S being transferred to the OUSD Policy Budget. The transfer was the result of the Defense Wide Review. | | | | | |
| ***Title:*** Defense Planning Scenarios Activities<br><br>***Description:*** This program is classified.<br><br>***FY 2020 Plans:***<br>Specific efforts are classified.<br><br>***FY 2021 Base Plans:***<br>Specific efforts are classified.<br><br>***FY 2021 OCO Plans:***<br>N/A<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:*** | 0.700 | 0.700 | 0.700 | 0.000 | 0.700 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
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| **Appropriation/Budget Activity**<br>0400 / 7 | **R-1 Program Element (Number/Name)**<br>PE 0305186D8Z / *Policy R&D Programs* | **Project (Number/Name)**<br>186 / *Policy R&D Programs* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| No change to planned costs. | | | | | |
| **Accomplishments/Planned Programs Subtotals** | 6.122 | 6.301 | 7.144 | 0.000 | 7.144 |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 7 | R-1 Program Element (Number/Name)<br>PE 0305186D8Z / *Policy R&D Programs* | Project (Number/Name)<br>186 / *Policy R&D Programs* | |

**Product Development ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Policy R&D Programs | Various | National Defense Univ, FFRDCs : Various | 36.161 | 6.122 | | 6.301 | | 7.144 | | 0.000 | | 7.144 | Continuing | Continuing | N/A |
| | | **Subtotal** | 36.161 | 6.122 | | 6.301 | | 7.144 | | 0.000 | | 7.144 | Continuing | Continuing | N/A |

**Remarks**

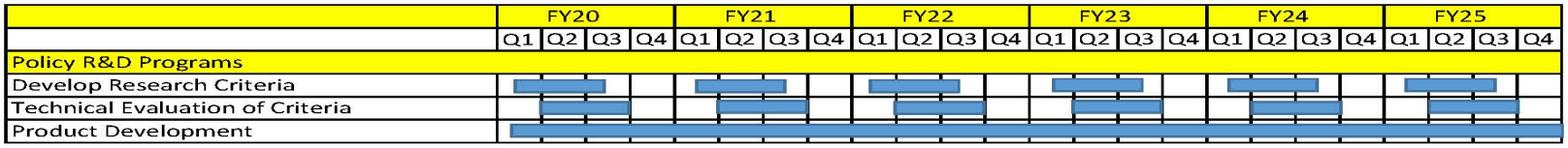
The Policy R&D Program provides analysis to overcome military challenges and for continued understanding of military structures, foreign cultures and ethnic issues.

| | Prior Years | FY 2019 | | FY 2020 | | FY 2021 Base | | FY 2021 OCO | | FY 2021 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | 36.161 | 6.122 | | 6.301 | | 7.144 | | 0.000 | | 7.144 | Continuing | Continuing | N/A |

**Remarks**

NA

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 7 | **R-1 Program Element (Number/Name)**<br>PE 0305186D8Z / *Policy R&D Programs* | **Project (Number/Name)**<br>186 / *Policy R&D Programs* |



| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 7 | **R-1 Program Element (Number/Name)**<br>PE 0305186D8Z / *Policy R&D Programs* | **Project (Number/Name)**<br>186 / *Policy R&D Programs* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***The Policy R&D Program provides analysis to overcome military challenges and for continued understanding of military structures, foreign cultures and ethnic issues*** | | | | |
| Policy R&D Program | 1 | 2020 | 4 | 2025 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 7: *Operational Systems Development* | **R-1 Program Element (Number/Name)**<br>PE 0305199D8Z / *Net Centricity* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 91.935 | 16.189 | 21.384 | 21.793 | - | 21.793 | 17.708 | 18.484 | 20.094 | 20.555 | Continuing | Continuing |
| 199: *GIG Evaluation Facilities (GIG-EF) and GIG Enterprise-Wide Systems Engineering Advisory Activities* | 91.935 | 16.189 | 21.384 | 21.793 | - | 21.793 | 17.708 | 18.484 | 20.094 | 20.555 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

Funds will be used to provide technical analysis, systems engineering and capability management oversight of programs, projects, initiatives and activities to maximize the Department's return on investment in information technology resources and affect a comprehensive approach for assessing and procuring critical information systems from initial design, through development to capability delivery in support of improved systems performance and military operations. Emphasis is placed on the information transport, information assurance/cyber security, network and spectrum management, command and control (C2) applications, systems and services, information sharing capabilities, commercial mobile devices (CMD), applications and infrastructure, and enterprise services activities focused on the development, integration, testing and technical assessment of capabilities and applications in joint and coalition warfighter support environments. Resources support collaborative efforts to demonstrate the interoperability and performance requirements of command, control, and communications (C3) capabilities and programs. This program is funded under Budget Activity 7, Operational System Development.

This project provides the resources necessary to implement net centric processes and authoritative analytic methods that provide the capability to synchronize interdependent C3 capabilities across all layers (ground, air, space, maritime, cyberspace) of the joint information environment (JIE), to forecast and achieve a balance in supply and demand for network capacity, and field effective capabilities more rapidly and efficiently as an enabler for C3 capabilities applications and services. Resources are required to transform current networks and information infrastructure into an operationally unified and architecturally diverse and secure joint information environment that will provide end-to-end communications transport layer, computing networks, and mission application capabilities that are optimized and integrated with all other joint capability areas with a focus on the tactical edge faced with disconnected, intermittent, and latency (DIL) environments. There will be technical assessments, modeling and simulation, and analysis of the Joint space communications layer, Joint aerial network layer, contested communications on the move, Position Navigation and Timing (PNT), C2 mission applications, commercial mobile devices, and information sharing capabilities. These funds provide the capability for the warfighter to manage and deconflict radio frequencies through ground, air, and space communication networks. The funds will be used to develop and synchronize information assurance and mission assurance capabilities with other joint information environment capabilities to provide secure access to information and services (e.g. Cryptographic Modernization Management plan).

In addition, funding will continue to be used to support the Defense Information System's Agency's (DISA) and Services' interoperable improvement efforts and processes in the development of common standards and protocols. This effort includes the Joint Interoperability Enhancement Process (IEP) that allows operators, engineers, and program managers to verify capabilities and identify issues in a design with Joint /Allied units prior to system fielding, or with fielded systems to identify

required systems changes for systems upgrade planning. DISA and the Joint Forces Combatant Command lead the effort to transform the current standards and interoperability management tools to a common set of Joint network-enabled standards to ensure adherence to the DoD Information Network (DODIN) enterprise-wide technical baseline and for implementation of future Tactical Data Link (TDL) capabilities. These joint standards, protocols, and processes will be used for implementation and testing to ensure the TDL capabilities are synchronized with the development and integration timelines of other planned network-enabled DODIN initiatives. The threats to the networking waveforms and the Joint NC migration will also be looked at in cooperation with the Intelligence agencies. In support of the National Defense Strategy (NDS), rebuilding the warfighting readiness of the Joint Force (Lethality); Net Centricity improves strategic and tactical C2 and Communications, CIO is actively supporting the services to accelerate modernization of Command and Control and Communication (C3) systems. As outlined in the NDS, the return of great power competition elevates the requirement for the Joint Force to dominate a highly contested conflict. DoD cannot assume the same robust, uninterrupted, tactical-to-strategic command and control network will remain intact against a peer-level adversary. Rather than existing across a single domain, these new network paths must leverage space, air, land, surface, sub-surface, and cyber to ensure redundancy against attack. To build confidence in our communication ability in a contested theater, DoD must make targeted investments that increase communication resiliency. This resilient architecture leverages multiple waveforms carried across space, air, land, surface, sub-surface and cyber minimizes periods that C2 will be degraded when communicating in a highly contested environment.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 16.742 | 21.384 | 20.066 | - | 20.066 |
| Current President's Budget | 16.189 | 21.384 | 21.793 | - | 21.793 |
| Total Adjustments | -0.553 | 0.000 | 1.727 | - | 1.727 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | -0.550 | - | | | |
| • Financing Cancelled Account | -0.003 | - | - | - | - |
| • DWR | - | - | -2.253 | - | -2.253 |
| • Economic Assumptions | - | - | -0.020 | - | -0.020 |
| • Increase Level Of Effort | - | - | 4.000 | - | 4.000 |

**Change Summary Explanation**

FY19: SIBR/STTR Reduction -0.550 million.

FY19: Reprogramming FY19 Financing Cancelled Account Reduction -0.003 million.

FY21:The FY 2021 funding request was reduced by $2.253 million during DWR to account for a reduction in studies and contract savings resulting in less funds needed.

FY21: Defense-Wide Economic Assumptions -.020 million.

FY21: The FY 2021 funding request was increased by $4.00 million, resulting in an increased level of effort.

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
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| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 7: *Operational Systems Development* | **R-1 Program Element (Number/Name)**<br>PE 0305199D8Z / *Net Centricity* |

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Net Centricity Plans and Accomplishments | 16.189 | 21.384 | 21.793 |
| ***FY 2020 Plans:***<br>– Continue technical assessment/refine commercial wireless policy guidance to support CMD strategy implementation; continue assessments of the effects of cybersecurity policies.<br>– Continue to refine CMD certification processes, Mobile Application Management (MAM)/Mobile Device Management (MDM) guidelines, and guidelines for personal user based enforcement; update approved product matrix for CMD.<br>– Continue implementation assessments to refine mobile application and device strategies.<br>– Review/refine mobile application approval process guides, DoD Mobile PKI guides, and procedure for the Electronic Flight Bag (EFB).<br>– Continue technical and business case analyses for Commercial mobile devices and voice encryption.<br>– Update the Radio and Communication Security modernization plan for tactical radios. Assess Service implementation.<br>– Continue analysis to update the CJTF Architecture to reflect Component C4II capability plans.<br>– Continue development of interoperable Land Mobile Radio (LMR) standards to support public safety communications.<br>– Continue analysis to of LMR policy implementation; refine procedures to support LMR implementation in the DoD.<br>– Continue analysis of Waveform Development and Management in the DoD.<br>– Continue analysis to maintain authoritative list of DoD-approved waveforms and supporting repository to maintain waveform baseline.<br>– Continue technical analysis on methods for securing ISR data over wireless platforms and extended encryption of these devices, conduct implementation assessments through UAS encryption data calls.<br>– Continue technical analysis and support for Protected, Wideband, Narrowband, and Commercial SATCOM. Assess strategy alignment.<br>– Update SATCOM Synchronization Architectures for Protected, Wideband, Narrowband and Commercial SATCOM capabilities.<br>– Continue compliance reviews of select programs; identify shortfalls in program bandwidth supportability planning and analysis and provide recommendations for corrective action.<br>– Continue efforts to implement SATCOM Gateway Right-sizing approaches to optimize SATCOM gateways across the defense enterprise.<br>– Continue technical/requirements analysis and feasibility assessments for implementing legacy narrowband solutions for MUOS payload.<br>– Continue analysis to support implementation approaches for JIPM alternatives.<br>– Conduct follow-on analysis in support of the Protected SATCOM AoA recommendations and preferred alternative.<br>– Continue support for the WCS AOA and follow-on analysis.<br>– Continue technical analysis to improve DoD utilization of Commercial SATCOM capabilities. | | | |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
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| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 7: *Operational Systems Development* | **R-1 Program Element (Number/Name)**<br>PE 0305199D8Z / *Net Centricity* |

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| – Conduct Airborne ISR (AISR) transport analysis of alternatives follow on analysis based on AoA recommendations and preferred alternatives. Update AISR transport reference and solution architecture artifacts to support implementation.<br>– Continue technical analysis of Coalition C2 and MNIS, analyze Coalition C2 functional requirements, strategic policy development and capability strategies to guide Mission Partner Environment (MPE) development.<br>– Continue technical analysis of selected joint and Service C2 programs/initiatives to promote enterprise approaches for data and services.<br>– Continue technical analysis for the implementation of Common Mission Network Transport (CMNT) capability.<br>– Continue technical analysis of MNIS programs and initiatives, related acquisition strategies, and functional requirements.<br>– Continue analyses to address adoption and evolution of mission services as candidate enterprise services for the JIE.<br>– Conduct follow-on analysis to inform implementation of the EoA recommendations for the GCCS Family of Systems.<br>– Continue analysis of capability needs to enable command and control across the JIE. Evaluate Enterprise Operations Center architectures, and information requirements to support investment decisions in JIE C2 capabilities.<br>– Continue analysis of requirements, capability gaps and integrated priority lists of all joint requirements for C3 capabilities to support DoD CIO engagement in the C4/Cyber Functional Capability Board.<br>– Continue wireless architecture and advanced technologies analysis to inform Department-wide policies and implementation of mobility solutions.<br>– Continue technical analysis to support compliance oversight of waveform policies and technical profile specifications.<br>– Continue efforts to refine communications policies and analysis technologies applicable to commercial mobile devices.<br>– Continue DoD Commercial Mobility implementation and systems engineering analysis Defense Mobile Unclassified and Classified Capabilities (DMUC/DMCC).<br>– Continue analysis to support DMUC derived credentials implementation.<br>– Continue analysis of 5G technology for DoD tactical use.<br>– Develop 5G standards engagement plan.<br>– Continue technical analysis for Network Management (NM) interoperability, architecture and data artifacts.<br>– Continue systems engineering and architecture analysis for JIE tactical processing nodes (TPNs).<br>– Continue analysis to address implementation of TSVSIC for tactical radios.<br>– Continue efforts to determine strengths, weaknesses, and uses of waveforms and network management capabilities; identified gaps; assesse new technologies in support of waveform and network management efforts.<br>– Continue technical analysis to support implementation of the network management strategy and roadmap.<br>– Continue development of data ontologies and NIEM compliant IEPDs for network management.<br>– Continue technical analysis in support of C3 policies, plans, studies, roadmaps, and capability assessments.<br>– Continue end-to-end analysis of the SATCOM environment; support technical evaluations of end-to-end capabilities.<br>– Continue studies and analysis in support of the DoD CIO's Mobile Device Strategy and Mobile Device Security Efforts. | | | |

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| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 7: *Operational Systems Development* | **R-1 Program Element (Number/Name)**<br>PE 0305199D8Z / *Net Centricity* |

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| – Continue Hub-Based HF Communications Concept to provide protected high rate communications needed for long range connectivity in satellite-denied environments<br>– Continue Wideband SATCOM AoA user demand projections develop planning decks and scenario guidance with Joint Staff/J6 coordinated scenarios description paper and CAPE concurrence.<br>– Continue oversight of Positioning, Navigation and Timing efforts and capability development through PNT Oversight Council and associated working groups.<br>– Continue Space-Based Positioning, Navigation, and Timing (PNT) EXCOM collaboration on path forward to develop formal CPNT system requirements to support U.S. Critical Infrastructure.<br>– Continue support for Interagency PNT efforts, including outreach, advocacy, and education.<br>– Continue to lead development efforts of the annual Federal Radionavigation Plan (FRP).<br>– Continue to provide secretariat support for the PNT Oversight Council, PNT Executive Management Board, and to lead associated PNT and navigation warfare working groups.<br>– Continue to provide secretariat support to the C5 Leadership Board.<br>– Continue PNT Trilateral MOA development (DoD, DOT, DHS) efforts.<br>– Continue precise time dissemination Trilateral MOA (DoD, DoC, DHS) efforts.<br>– Continue development of the roadmap for fielding Modernized GPS User equipment (MGUE).<br>– Continue oversight and direction of efforts to develop and field resilient software assurance measures for MGUE.<br>– Continue support for Multi-GNSS policy development.<br>– Continue support and leadership role in NATO CaP2 efforts.<br>– Continue to support secure voice interoperability and desires to drive planning for UHF anti-jam (SATURN) planning through NATO channels.<br>– Continue technical analysis/studies related to the migration of current applications and services to DoD Core Data Centers and support rationalization of applications for the JIE.<br>– Continue technical analysis to support implementation of JIE capability upgrades and technical planning.<br>– Continue studies and analysis to progress of JIE technical implementation actions.<br>– Continue technical analysis and studies related to SDN as an approach to network normalization and security.<br>– Continue Joint IEP analysis for Link 16 and work on adding Variable Message Format (VMF), Link 11/22, Multifunction Advanced Data Link (MADL), and Common Data Link (CDL) through the FYDP.<br>– Continue technical and policy assessments to enable TDL migration.<br>– Continue efforts to finalize Joint MIL-SPEC for CDL and initiate documentation for MADL in coordination with JSF team.<br>– Continue support for Allied and Coalition interoperability efforts including NATO migration plan, JSF partner interoperability, US/ Swedish MIEA, and integration of US and foreign communications and C2 systems.<br>– Assess developing waveform technologies for improving the robustness and scalability of current TDL networks. | | | |

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| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| – Continue efforts to refine and implement gateway right sizing options; evaluate RF terminal solutions and baseband equipment suites including the number and types of equipment needed to meet the future needs of the war fighter. Coordinate and facilitate Teleport Program Office oversight initiatives.<br>– Continue analysis to evolve SATCOM networks toward EOIP modem architecture. Continue support of video dissemination and two-way GBS capabilities to inform follow on implementation across the Department.<br>– Continue analysis for the SATCOM International Standards Committee (SISC). Participate in the development of US lead Standardized Agreements (STANAGS) and provide a technical review of other nation's STANAG's for accuracy, completeness, and feasibility.<br>– Continue efforts to evaluate and implement acquisition strategies for U.S. support to NATO SATCOM.<br>– Continue technical analysis and facilitate execution of the SATCOM Systems Engineering Group (SSEG).<br>– Continue efforts to review, assess, and process DISN Tech Refresh plans for CIO approval.<br>– Coordinate, facilitate, and record DISN Quarterly reviews to assessed progress and issues in transport and network infrastructure, unified capabilities and network management.<br>– Continue efforts to maintain JIE Infrastructure Framework and synchronization roadmap to track infrastructure deployment or implementation.<br>– Continue acquisition like review of JIE objectives, plans, technical approaches, schedules and cost factors to support technical reviews of JIE implementation.<br>– Support the development of business case activities as required.<br>Develop guidance (e.g., information system security engineering guidance) and programming recommendations to ensure the integration of Trusted Systems Networks concepts and processes into the acquisition and maintenance of DoD information systems, enclaves, and services, including the purchase and integration of tactical communication commodities. | | | |
| ***FY 2021 Plans:***<br>– Continue technical assessment/refine commercial wireless policy guidance to support CMD strategy implementation; continue assessments of the effects of cybersecurity policies.<br>– Continue to refine CMD certification processes, Mobile Application Management (MAM)/Mobile Device Management (MDM) guidelines, and guidelines for personal user based enforcement; update approved product matrix for CMD.<br>– Continue implementation assessments to refine mobile application and device strategies.<br>– Review/refine mobile application approval process guides, DoD Mobile PKI guides, and procedure for the Electronic Flight Bag (EFB).<br>– Development of an analytical model that facilitates rapid, safe, and operationally adequate access to the 1030/1090MHz spectrum.<br>– Continue technical and business case analyses for Commercial mobile devices and voice encryption.<br>– Update the Radio and Communication Security modernization plan for tactical radios. Assess Service implementation. | | | |

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| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| – Continue analysis to update the CJTF Architecture to reflect Component C4II capability plans.<br>– Continue development of interoperable Land Mobile Radio (LMR) standards to support public safety communications.<br>– Continue analysis to of LMR policy implementation; refine procedures to support LMR implementation in the DoD.<br>– Continue analysis of Waveform Development and Management in the DoD.<br>– Continue analysis to maintain authoritative list of DoD-approved waveforms and supporting repository to maintain waveform baseline.<br>– Continue technical analysis on methods for securing ISR data over wireless platforms and extended encryption of these devices, conduct implementation assessments through UAS encryption data calls.<br>– Continue technical analysis and support for Protected, Wideband, Narrowband, and Commercial SATCOM. Assess strategy alignment.<br>– Update SATCOM Synchronization Architectures for Protected, Wideband, Narrowband and Commercial SATCOM capabilities.<br>– Continue compliance reviews of select programs; identify shortfalls in program bandwidth supportability planning and analysis and provide recommendations for corrective action.<br>– Continue efforts to implement SATCOM Gateway Right-sizing approaches to optimize SATCOM gateways across the defense enterprise.<br>– Continue technical/requirements analysis and feasibility assessments for implementing legacy narrowband solutions for MUOS payload.<br>– Continue analysis to support implementation approaches for JIPM alternatives.<br>– Conduct follow-on analysis in support of the Protected SATCOM AoA recommendations and preferred alternative.<br>– Continue support for the WCS AOA and follow-on analysis.<br>– Continue technical analysis to improve DoD utilization of Commercial SATCOM capabilities.<br>– Conduct Airborne ISR (AISR) transport analysis of alternatives follow on analysis based on AoA recommendations and preferred alternatives. Update AISR transport reference and solution architecture artifacts to support implementation.<br>– Continue technical analysis of Coalition C2 and MNIS, analyze Coalition C2 functional requirements, strategic policy development and capability strategies to guide Mission Partner Environment (MPE) development.<br>– Continue technical analysis of selected joint and Service C2 programs/initiatives to promote enterprise approaches for data and services.<br>– Continue technical analysis for the implementation of Common Mission Network Transport (CMNT) capability.<br>– Continue technical analysis of MNIS programs and initiatives, related acquisition strategies, and functional requirements.<br>– Continue analyses to address adoption and evolution of mission services as candidate enterprise services for the JIE.<br>– Conduct follow-on analysis to inform implementation of the EoA recommendations for the GCCS Family of Systems.<br>– Continue analysis of capability needs to enable command and control across the JIE. Evaluate Enterprise Operations Center architectures, and information requirements to support investment decisions in JIE C2 capabilities. | | | |

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| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| – Continue analysis of requirements, capability gaps and integrated priority lists of all joint requirements for C3 capabilities to support DoD CIO engagement in the C4/Cyber Functional Capability Board.<br>– Continue wireless architecture and advanced technologies analysis to inform Department-wide policies and implementation of mobility solutions.<br>– Continue technical analysis to support compliance oversight of waveform policies and technical profile specifications.<br>– Continue efforts to refine communications policies and analysis technologies applicable to commercial mobile devices.<br>– Continue DoD Commercial Mobility implementation and systems engineering analysis Defense Mobile Unclassified and Classified Capabilities (DMUC/DMCC).<br>– Continue analysis to support DMUC derived credentials implementation.<br>– Continue analysis of 5G technology for DoD tactical use.<br>– Develop 5G standards engagement plan.<br>– Continue technical analysis for Network Management (NM) interoperability, architecture and data artifacts.<br>– Continue systems engineering and architecture analysis for JIE tactical processing nodes (TPNs).<br>– Continue analysis to address implementation of TSVSIC for tactical radios.<br>– Continue efforts to determine strengths, weaknesses, and uses of waveforms and network management capabilities; identified gaps; assesse new technologies in support of waveform and network management efforts.<br>– Continue technical analysis to support implementation of the network management strategy and roadmap.<br>– Continue development of data ontologies and NIEM compliant IEPDs for network management.<br>– Continue technical analysis in support of C3 policies, plans, studies, roadmaps, and capability assessments.<br>– Continue end-to-end analysis of the SATCOM environment; support technical evaluations of end-to-end capabilities.<br>– Continue studies and analysis in support of the DoD CIO's Mobile Device Strategy and Mobile Device Security Efforts.<br>– Continue Hub-Based HF Communications Concept to provide protected high rate communications needed for long range connectivity in satellite-denied environments<br>– Continue Wideband SATCOM AoA user demand projections develop planning decks and scenario guidance with Joint Staff/J6 coordinated scenarios description paper and CAPE concurrence.<br>– Continue oversight of Positioning, Navigation and Timing efforts and capability development through PNT Oversight Council and associated working groups.<br>– Continue Space-Based Positioning, Navigation, and Timing (PNT) EXCOM collaboration on path forward to develop formal CPNT system requirements to support U.S. Critical Infrastructure.<br>– Continue support for Interagency PNT efforts, including outreach, advocacy, and education.<br>– Continue to lead development efforts of the annual Federal Radionavigation Plan (FRP).<br>– Continue to provide secretariat support for the PNT Oversight Council, PNT Executive Management Board, and to lead associated PNT and navigation warfare working groups.<br>– Continue to provide secretariat support to the C5 Leadership Board. | | | |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 7: *Operational Systems Development* | **R-1 Program Element (Number/Name)**<br>PE 0305199D8Z / *Net Centricity* |

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| – Continue PNT Trilateral MOA development (DoD, DOT, DHS) efforts.<br>– Continue precise time dissemination Trilateral MOA (DoD, DoC, DHS) efforts.<br>– Continue development of the roadmap for fielding Modernized GPS User equipment (MGUE).<br>– Continue oversight and direction of efforts to develop and field resilient software assurance measures for MGUE.<br>– Continue support for Multi-GNSS policy development.<br>– Continue support and leadership role in NATO CaP2 efforts.<br>– Continue to support secure voice interoperability and desires to drive planning for UHF anti-jam (SATURN) planning through NATO channels.<br>– Continue technical analysis/studies related to the migration of current applications and services to DoD Core Data Centers and support rationalization of applications for the JIE.<br>– Continue technical analysis to support implementation of JIE capability upgrades and technical planning.<br>– Continue studies and analysis to progress of JIE technical implementation actions.<br>– Continue technical analysis and studies related to SDN as an approach to network normalization and security.<br>– Continue Joint IEP analysis for Link 16 and work on adding Variable Message Format (VMF), Link 11/22, Multifunction Advanced Data Link (MADL), and Common Data Link (CDL) through the FYDP.<br>– Continue technical and policy assessments to enable TDL migration.<br>– Continue efforts to finalize Joint MIL-SPEC for CDL and initiate documentation for MADL in coordination with JSF team.<br>– Continue support for Allied and Coalition interoperability efforts including NATO migration plan, JSF partner interoperability, US/ Swedish MIEA, and integration of US and foreign communications and C2 systems.<br>– Assess developing waveform technologies for improving the robustness and scalability of current TDL networks.<br>– Continue efforts to refine and implement gateway right sizing options; evaluate RF terminal solutions and baseband equipment suites including the number and types of equipment needed to meet the future needs of the war fighter. Coordinate and facilitate Teleport Program Office oversight initiatives.<br>– Continue analysis to evolve SATCOM networks toward EOIP modem architecture. Continue support of video dissemination and two-way GBS capabilities to inform follow on implementation across the Department.<br>– Continue analysis for the SATCOM International Standards Committee (SISC). Participate in the development of US lead Standardized Agreements (STANAGS) and provide a technical review of other nation's STANAG's for accuracy, completeness, and feasibility.<br>– Continue efforts to evaluate and implement acquisition strategies for U.S. support to NATO SATCOM.<br>– Continue technical analysis and facilitate execution of the SATCOM Systems Engineering Group (SSEG).<br>– Continue efforts to review, assess, and process DISN Tech Refresh plans for CIO approval.<br>– Coordinate, facilitate, and record DISN Quarterly reviews to assessed progress and issues in transport and network infrastructure, unified capabilities and network management. | | | |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 7: *Operational Systems Development* | **R-1 Program Element (Number/Name)**<br>PE 0305199D8Z / *Net Centricity* |

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| – Continue efforts to maintain JIE Infrastructure Framework and synchronization roadmap to track infrastructure deployment or implementation.<br>– Continue acquisition like review of JIE objectives, plans, technical approaches, schedules and cost factors to support technical reviews of JIE implementation.<br>– Support the development of business case activities as required.<br>Develop guidance (e.g., information system security engineering guidance) and programming recommendations to ensure the integration of Trusted Systems Networks concepts and processes into the acquisition and maintenance of DoD information systems, enclaves, and services, including the purchase and integration of tactical communication commodities.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>The funding was re-phased due to a prior year reduction. | | | |
| **Accomplishments/Planned Programs Subtotals** | 16.189 | 21.384 | 21.793 |

**D. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**E. Acquisition Strategy**

N/A

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 7 | **R-1 Program Element (Number/Name)**<br>PE 0305199D8Z / *Net Centricity* | **Project (Number/Name)**<br>199 / *GIG Evaluation Facilities (GIG-EF) and GIG Enterprise-Wide Systems Engineering Advisory Activities* |

**Support ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Studies and Analysis | Various | Various : Various | 12.042 | 6.562 | Jul 2019 | 6.130 | Jul 2020 | 4.747 | Jul 2021 | - | | 4.747 | Continuing | Continuing | Continuing |
| Technical Engineering Services | Various | Various : Various | 49.295 | 1.414 | Jul 2019 | 1.000 | Jul 2020 | 1.000 | Jul 2021 | - | | 1.000 | Continuing | Continuing | Continuing |
| | | **Subtotal** | 61.337 | 7.976 | | 7.130 | | 5.747 | | - | | 5.747 | Continuing | Continuing | N/A |

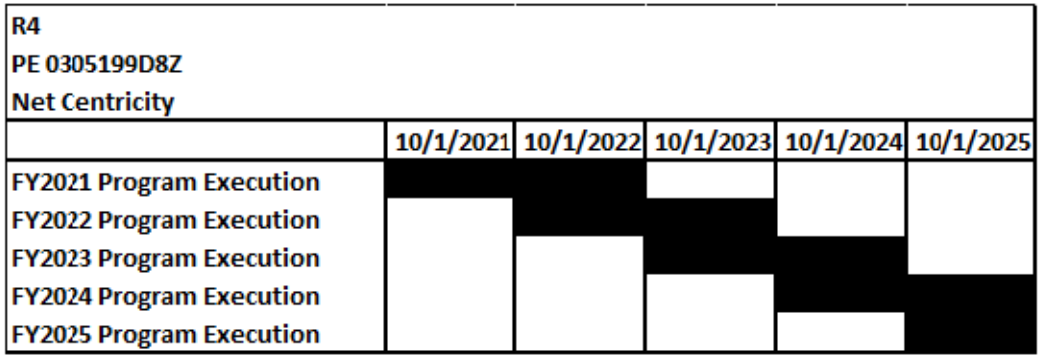
**Management Services ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Program Management Support | Various | Various : Various | 16.677 | 2.000 | Jul 2019 | 5.679 | Jul 2020 | 4.480 | Jul 2021 | - | | 4.480 | Continuing | Continuing | Continuing |
| Program Support | FFRDC | Various : Various | 1.592 | 0.097 | Jul 2019 | 0.098 | Jul 2020 | 0.066 | Jul 2021 | - | | 0.066 | Continuing | Continuing | Continuing |
| Engineering Support | FFRDC | Various : Various | 10.653 | 3.825 | Jul 2019 | 5.811 | Jul 2020 | 9.000 | Jul 2012 | - | | 9.000 | Continuing | Continuing | Continuing |
| R&D Support | Various | Various : Various | 1.676 | 2.291 | Jul 2019 | 2.666 | Jul 2020 | 2.500 | Jul 2021 | - | | 2.500 | Continuing | Continuing | Continuing |
| | | **Subtotal** | 30.598 | 8.213 | | 14.254 | | 16.046 | | - | | 16.046 | Continuing | Continuing | N/A |

| | Prior Years | FY 2019 | | FY 2020 | | FY 2021 Base | | FY 2021 OCO | | FY 2021 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | 91.935 | 16.189 | | 21.384 | | 21.793 | | - | | 21.793 | Continuing | Continuing | N/A |

**Remarks**

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 7 | **R-1 Program Element (Number/Name)**<br>PE 0305199D8Z / *Net Centricity* | **Project (Number/Name)**<br>199 / *GIG Evaluation Facilities (GIG-EF) and GIG Enterprise-Wide Systems Engineering Advisory Activities* |



| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 7 | **R-1 Program Element (Number/Name)**<br>PE 0305199D8Z / *Net Centricity* | **Project (Number/Name)**<br>199 / *GIG Evaluation Facilities (GIG-EF) and GIG Enterprise-Wide Systems Engineering Advisory Activities* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ****** SUBPROJECT TITLE ****** | | | | |
| FY 2021 Projected Execution | 3 | 2021 | 2 | 2022 |
| FY 2022 Projected Execution | 1 | 2022 | 2 | 2023 |
| FY 2023 Projected Execution | 1 | 2023 | 2 | 2024 |
| FY 2024 Projected Execution | 1 | 2024 | 2 | 2025 |
| FY 2025 Projected Execution | 1 | 2025 | 4 | 2025 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 7: *Operational Systems Development* | **R-1 Program Element (Number/Name)**<br>PE 0305387D8Z / *Homeland Defense Technology Transfer Program* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | 20.419 | 1.137 | 2.221 | 2.190 | - | 2.190 | 2.304 | 2.298 | 2.313 | 2.359 | Continuing | Continuing |
| 387: *Homeland Defense Technology Transfer Program* | 20.419 | 1.137 | 2.221 | 2.190 | - | 2.190 | 2.304 | 2.298 | 2.313 | 2.359 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**Note**

In conjunction with Congressionally directed (Sec. 1401, P.L. 107-314) Homeland Defense Technology Transfer program, ensures a successful and balanced transfer of dual-use technology equipment and information to first responders without impeding military readiness. Accelerates dual-use tech transfer to first responders, increases effectiveness of equipment transfers to first responders, and transfers technology through a transitional effort that has dual utility to improve homeland security and enhance public safety without degrading military readiness. Meets the Congressional intent of Sec 1401, FY 2003 National Defense Authorization Act (P.L. 107-314). The program supports the National Defense Strategy through continuously delivering performance with affordability and speed as we change Departmental mindset, culture, and management systems.

**A. Mission Description and Budget Item Justification**

Continues Congressionally directed (Sec. 1401, P.L. 107-314) Technology Transfer Program to consolidate and coordinate various military endeavors that pass technology and equipment to first responders. Works with a variety of DoD activities, interagency partners, and first responder organizations to ensure that dual-use military technology is expedited into the commercial sector for use by law enforcement, fire, and emergency medical service personnel. Works with the Military Departments and Defense Logistics Agency to ensure that appropriate excess military equipment is made available to the first responder community on an expedited basis. Fulfills Congressional intent to help improve public safety and enhance public security.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 1.137 | 2.221 | 2.221 | - | 2.221 |
| Current President's Budget | 1.137 | 2.221 | 2.190 | - | 2.190 |
| Total Adjustments | 0.000 | 0.000 | -0.031 | - | -0.031 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | - | - | | | |
| • Funding transferred to O*M Labor account PE:0907388D8Z | - | - | -0.028 | - | -0.028 |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 7: *Operational Systems Development* | **R-1 Program Element (Number/Name)**<br>PE 0305387D8Z / *Homeland Defense Technology Transfer Program* |

| | | | | | |
|---|---|---|---|---|---|
| • Inflation Adj | - | - | -0.003 | - | -0.003 |

**Change Summary Explanation**

FY 2021 change reflects a decrease in support costs.

| C. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Homeland Defense Technology Transfer Program | 1.137 | 2.221 | 2.190 |
| ***Description:*** Provided outreach through coordination and cooperation with inter-agency partners to provide dual-use technology and equipment to first responders. Ensured DoD components conducted Technology Transfer programs that are appropriate for the respective component. Provided information to stakeholders on equipment and technology use and availability.<br><br>***FY 2020 Plans:***<br>- Use a consortium of subject matter experts/governance councils to prioritize technology transfer requirements and expedite DoD dual-use technologies.<br>- Continue program outreach activities and prioritize outreach to reflect efficiencies.<br>- Enhance and expedite excess equipment transfer capabilities from service level divestiture efforts and overseas contingency operations.<br><br>***FY 2021 Plans:***<br>- Continue research on ongoing programs such as Project Emily training and testing.<br>- Use a consortium of subject matter experts/governance councils to prioritize technology transfer requirements and expedite DoD dual-use technologies.<br>- Continue program outreach activities and prioritize outreach to reflect efficiencies.<br>- Enhance and expedite excess equipment transfer capabilities from service level divestiture efforts and overseas contingency operations.<br><br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>FY 2021 adjustment will be achieved by reducing training costs.. | | | |
| **Accomplishments/Planned Programs Subtotals** | 1.137 | 2.221 | 2.190 |

**D. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**E. Acquisition Strategy**

N/A

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 7 | R-1 Program Element (Number/Name)<br>PE 0305387D8Z / *Homeland Defense Technology Transfer Program* | Project (Number/Name)<br>387 / *Homeland Defense Technology Transfer Program* | |

**Product Development ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Homeland Defense Transfer of Dual-use Technology Equipment | MIPR | Navy Commands : SPAWAR, NSWC, ONR | 20.419 | 1.137 | | 2.221 | | 2.190 | | - | | 2.190 | Continuing | Continuing | - |
| | | **Subtotal** | 20.419 | 1.137 | | 2.221 | | 2.190 | | - | | 2.190 | Continuing | Continuing | N/A |

**Remarks**

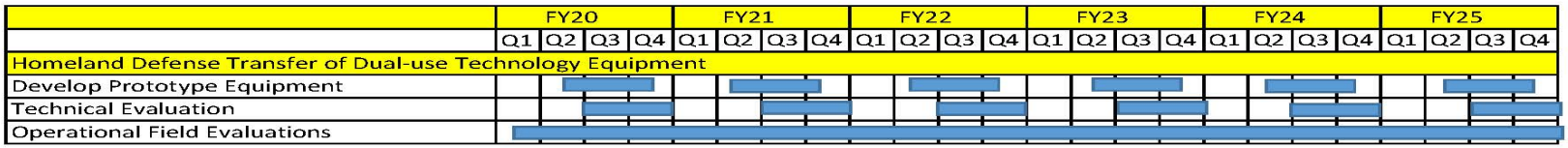
N/A

| | Prior Years | FY 2019 Cost | FY 2019 Award Date | FY 2020 Cost | FY 2020 Award Date | FY 2021 Base Cost | FY 2021 Base Award Date | FY 2021 OCO Cost | FY 2021 OCO Award Date | FY 2021 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | 20.419 | 1.137 | | 2.221 | | 2.190 | | - | | 2.190 | Continuing | Continuing | N/A |

**Remarks**

N/A

| Exhibit R-4, RDT&E Schedule Profile: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 7 | **R-1 Program Element (Number/Name)**<br>PE 0305387D8Z / *Homeland Defense Technology Transfer Program* | **Project (Number/Name)**<br>387 / *Homeland Defense Technology Transfer Program* |



| Exhibit R-4A, RDT&E Schedule Details: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 7 | **R-1 Program Element (Number/Name)**<br>PE 0305387D8Z / *Homeland Defense Technology Transfer Program* | **Project (Number/Name)**<br>387 / *Homeland Defense Technology Transfer Program* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***Technology Transfer*** | | | | |
| Homeland Defense Transfer of Dual-use Technology Equipment | 1 | 2020 | 4 | 2025 |

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 8: *Software and Digital Technology Pilot Programs* | **R-1 Program Element (Number/Name)**<br>PE 0608648D8Z / *Acquisition Visibility - Software Pilot Program* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | - | 0.000 | 0.000 | 16.848 | 0.000 | 16.848 | 17.150 | 16.803 | 16.519 | 16.969 | Continuing | Continuing |
| 059: *Acquisition Visibility* | - | 0.000 | 0.000 | 16.848 | 0.000 | 16.848 | 17.150 | 16.803 | 16.519 | 16.969 | Continuing | Continuing |

**Note**

This program is not a new start. Acquisition Visibility (AV) is a Software Pilot Program under the new BA 8 authority. Prior years were funded under PE 0603821D8Z (RDT&E) and PE 0903399D8Z (O&M).

**A. Mission Description and Budget Item Justification**

The AV investment funds an agile software pilot to deliver and sustain the Department's authoritative acquisition data through NIPR and SIPR instances of the Defense Acquisition Visibility Environment (DAVE), provide data access and standards via the Acquisition Visibility Data Matrix (AVDM), and accelerate the retirement of costly legacy systems. AV is the sole authoritative source for acquisition data inside the DoD and for the Congress, GAO, and the Inspectors General for multiple Acquisition Pathways including all Acquisition Category (ACAT) I – IV MDAP programs, Middle Tier of Acquisition programs, and National Command, Control, and Communications programs. It provides acquisition data for Comptroller's ADVANA, Air Force and Army PMRT, Navy RDAIS, and EVM- CR.

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 0.000 | 0.000 | 0.000 | - | 0.000 |
| Current President's Budget | 0.000 | 0.000 | 16.848 | - | 16.848 |
| Total Adjustments | 0.000 | 0.000 | 16.848 | - | 16.848 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | - | - | | | |
| • Creation of Acquisition Visibility Software Pilot Program Line | - | - | 22.206 | - | 22.206 |
| • Economic Assumption | - | - | -0.007 | - | -0.007 |
| • Internal Re-alignment for the Software Pilot Program | - | - | -5.351 | - | -5.351 |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 8: *Software and Digital Technology Pilot Programs* | **R-1 Program Element (Number/Name)**<br>PE 0608648D8Z *I Acquisition Visibility - Software Pilot Program* |

**Change Summary Explanation**

Acquisition Visibility (AV) is a Software Pilot Program under the new BA 8 authority. The program is not a new start; prior years RDT&E was funded by PE 0603821D8Z and O&M was funded by PE 0903399D8Z (O&M).

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | | | | | | | | | Date: February 2020 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 8 | | | | | R-1 Program Element (Number/Name)<br>PE 0608648D8Z / *Acquisition Visibility - Software Pilot Program* | | | | Project (Number/Name)<br>059 / *Acquisition Visibility* | | | |
| **COST ($ in Millions)** | **Prior Years** | **FY 2019** | **FY 2020** | **FY 2021 Base** | **FY 2021 OCO** | **FY 2021 Total** | **FY 2022** | **FY 2023** | **FY 2024** | **FY 2025** | **Cost To Complete** | **Total Cost** |
| 059: *Acquisition Visibility* | - | 0.000 | 0.000 | 16.848 | 0.000 | 16.848 | 17.150 | 16.803 | 16.519 | 16.969 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

Acquisition Visibility delivers authoritative, reliable acquisition data to the Congress and Department to enable statutory reporting, executive decision making, and portfolio insight on almost $2 trillion in lifecycle funding across ~86 ACAT I, ~2500 ACAT II, III, and IV programs, and ~50 MTA programs.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|
| ***Title:*** Acquisition Visibility Sustainment<br>***Description:*** These efforts were previously funded with O&M from PE 0903399D8Z. Acquisition Visibility Sustainment delivers authoritative acquisition programs data to the Congress and DoD's DAE, CAEs, Service Chiefs of Staff, OSD senior leaders, and OSD and Component analysts.<br>***FY 2021 Plans:***<br>Plans include continued delivery legacy capabilities to maintain Congressional reporting requirements and decision support to the DAE, CAEs, Service Chiefs of Staff, OSD senior leaders, and OSD and Component analysts.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Increase from 0.000 to 10.574 reflects transition of O&M funds from PE 0903399D8Z to newly created Acquisition Visibility Software Pilot Program. | - | - | 10.574 |
| ***Title:*** Defense Acquisition Visibility Environment (DAVE)<br>***Description:*** DAVE investments were previously funded with RDT&E in PE 0603821D8Z. DAVE will replace numerous costly and outdated legacy systems.<br>***FY 2021 Plans:***<br>Plans include continued development and prototyping of legacy capabilities transitioning to DAVE and development and prototyping of new acquisition visibility capabilities and applications to improve analysis and decision-making including Acquisition Program Baselines, and a SIPRNet acquisition data Analytic Layer.<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Increase from 0.000 to 6.274 reflects transition of former PE 0603821D8Z to newly created Acquisition Visibility Software Pilot Program. | 0.000 | - | 6.274 |
| **Accomplishments/Planned Programs Subtotals** | 0.000 | - | 16.848 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 8 | **R-1 Program Element (Number/Name)**<br>PE 0608648D8Z / *Acquisition Visibility - Software Pilot Program* | **Project (Number/Name)**<br>059 / *Acquisition Visibility* |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Capability development is acquired through a combination of competed small-disadvantaged business and small business contracts employing agile software development methodologies.

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 8: *Software and Digital Technology Pilot Programs* | **R-1 Program Element (Number/Name)**<br>PE 0308588D8Z *I Algorithmic Warfare Cross Functional Teams - Software Pilot Program* |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Program Element | - | 0.000 | 0.000 | 250.107 | 0.000 | 250.107 | 252.176 | 120.193 | 121.255 | 122.180 | Continuing | Continuing |
| 925: *Algorithmic Warfare Cross Functional Teams - Software Pilot Program* | - | 0.000 | 0.000 | 250.107 | 0.000 | 250.107 | 252.176 | 120.193 | 121.255 | 122.180 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

Provides for agile development, test and evaluation, procurement, production and modification, and the operation and maintenance of Software and Digital Technology Pilot Programs. Characteristics of this budget activity include software, and electronic tools, systems, applications, resources, acquisition of services, business process re-engineering activities, functional requirements development, technical evaluations, and other activities in direct support of acquiring, developing, deploying, sustaining, enhancing, and modernizing Software and Digital Technology Pilot Programs. AWCFT funds Project Maven, a rapid fielding Artificial Intelligence (AI) program to augment and automate Processing, Exploitation and Dissemination (PED) for Full Motion Video (FMV) Tactical Unmanned Aerial Vehicles (TUAVs), Medium Altitude, High Altitude, and Wide Area Motion Imagery (WAMI) Intelligence, Surveillance and Reconnaissance (ISR) platforms in support of defeat-ISIS and National Defense Strategy (NDS) peer/near peer competitor strategy. Project Maven also brings AI to Captured Enemy Material (CEM), Acoustical Intelligence (ACINT), Overhead Persistent Infrared program (OPIR) and Public Available Information (PAI) exploitation. Project Maven uses AI, deep learning, and computer vision algorithms to detect, classify, and track objects within FMV images (e.g., person, vehicle, and weapon) and other AI algorithms for CEM and text based projects. Maven algorithms increase the intelligence value of ISR, reduce the human burden of screening so analysts can multi-task increasing productivity, and seeds the generation of insight from Geospatial Intelligence (GEOINT). Project Maven is a commercial technology initiative that inserts commercial AI into existing programs of records. Most military intelligence exploitation systems were designed pre-AI and require specialized integration to enable the insertion of algorithms into their software baseline. Project Maven is the pathfinder AI initiative for the DoD and is investing in critical AI architecture to support the rapid expansion of AI to other mission areas besides GEOINT. As Project Maven algorithms increase in capability, the algorithms will move to the edge (on the sensor platform).

| B. Program Change Summary ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Current President's Budget | 0.000 | 0.000 | 250.107 | 0.000 | 250.107 |
| Total Adjustments | 0.000 | 0.000 | 250.107 | 0.000 | 250.107 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | - | - | | | |
| • Departmental Decision | 0.000 | 0.000 | 250.107 | 0.000 | 250.107 |

| Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Office of the Secretary Of Defense | Date: February 2020 |
|---|---|
| **Appropriation/Budget Activity**<br>0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 8: *Software and Digital Technology Pilot Programs* | **R-1 Program Element (Number/Name)**<br>PE 0308588D8Z *I Algorithmic Warfare Cross Functional Teams - Software Pilot Program* |

**Change Summary Explanation**

Funds are transferred from BA-6 to BA-8 Software and Digital Technology Pilot programs. The increase in FY21 is the Department's realization of the importance of AI in support of the NDS.

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | | Date: February 2020 |
|---|---|---|---|
| Appropriation/Budget Activity<br>0400 / 8 | R-1 Program Element (Number/Name)<br>PE 0308588D8Z / *Algorithmic Warfare Cross Functional Teams - Software Pilot Program* | Project (Number/Name)<br>925 / *Algorithmic Warfare Cross Functional Teams - Software Pilot Program* | |

| COST ($ in Millions) | Prior Years | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total | FY 2022 | FY 2023 | FY 2024 | FY 2025 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 925: *Algorithmic Warfare Cross Functional Teams - Software Pilot Program* | - | 0.000 | 0.000 | 250.107 | 0.000 | 250.107 | 252.176 | 120.193 | 121.255 | 122.180 | Continuing | Continuing |

**A. Mission Description and Budget Item Justification**

Algorithmic Warfare Cross Functional Team funds Project Maven which fields increasing amounts of automation to FMV ground exploitation stations for TUAVs, Medium Altitude, High Altitude ISR platforms and accelerates the development and deployment of AI capabilities across the Defense Intelligence Enterprise, including exploitation of CEM, ACINT, OPIR and PAI exploitation. Project Maven uses artificial intelligence, deep learning, and computer vision algorithms to detect, classify, and track objects within FMV images (e.g., person, vehicle, and weapon) and other AI algorithms for CEM and text based projects. Project Maven algorithms increase the intelligence value of ISR, reduce the human burden of screening so analysts can multi-task increasing productivity, and seeds the generation of insight from GEOINT. Project Maven is a commercial technology initiative that inserts commercial AI into existing programs of records. Most military intelligence exploitation systems were designed pre-AI and require specialized integration to enable the insertion of algorithms into their software baseline. Project Maven is the pathfinder AI initiative for the DoD and is investing in critical AI architecture to support the rapid expansion of AI to other mission areas besides GEOINT. As Project Maven algorithms increase in capability, the algorithms will move to the edge (on the sensor platform).

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| ***Title:*** Algorithmic Warfare Cross Functional Teams - Software Pilot Program | 0.000 | 0.000 | 250.107 | 0.000 | 250.107 |
| ***Description:*** AWCFT funds Project Maven, a rapid fielding AI program to augment and automate PED for FMV of TUAVs, Medium Altitude, High Altitude, and WAMI ISR platforms in support of defeat-ISIS and NDS peer/ near peer competitor strategy. Project Maven also brings AI to CEM, ACINT, OPIR and PAI exploitation. Project Maven uses artificial intelligence, deep learning, and computer vision algorithms to detect, classify, and track objects within FMV images (e.g., person, vehicle, and weapon) and other AI algorithms for CEM and text based projects. Project Maven algorithms increase the intelligence value of ISR, reduce the human burden of screening so analysts can multi-task increasing productivity, and seeds the generation of insight from GEOINT. Project Maven is a commercial technology initiative that inserts commercial AI into existing programs of records. Most military intelligence exploitation systems were designed pre-AI and require specialized integration to enable the insertion of algorithms into their software baseline. Project Maven is the pathfinder AI initiative for the DoD and is investing in critical architecture to support the rapid expansion of AI to other mission areas besides GEOINT. As Project Maven algorithms increase in capability, the algorithms will move to the edge (on the sensor platform). | | | | | |
| ***FY 2020 Plans:*** | | | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 8 | **R-1 Program Element (Number/Name)**<br>PE 0308588D8Z / *Algorithmic Warfare Cross Functional Teams - Software Pilot Program* | **Project (Number/Name)**<br>925 / *Algorithmic Warfare Cross Functional Teams - Software Pilot Program* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2019 | FY 2020 | FY 2021 Base | FY 2021 OCO | FY 2021 Total |
|---|---|---|---|---|---|
| Project Maven's FMV Sprint 2 capability is now deployed to 40 sites within the Army, Navy, Marine Corps, and Air Force (TUAV and Medium Altitude MQ1-C and MQ9) automatically detecting and geo-locating people, vehicles and buildings, tracking objects in motion, and capturing training data for continued algorithm improvements. Project Maven started by bringing AI to the FMV COIN fight to improve the speed and accuracy of analysis and reduce the manpower burden of video exploitation. The investments in AI for FMV COIN are being leveraged for high end warfare to detect conventional military equipment such as tanks, artillery, airplanes and missile launchers. Project Maven FMV algorithms will be deployed to Air Force and Army units and additional OCONUS sites.<br>***FY 2021 Base Plans:***<br>Project Maven uses rapid prototype sprints to field increasing amounts of automation to FMV ground exploitation stations for TUAVs, Medium Altitude, High Altitude and WAMI ISR platforms and accelerate the development and deployment of AI capabilities across the Defense Intelligence Enterprise, including exploitation of CEM, ACINT,OPIR and PAI exploitation Project Maven will continue to use artificial intelligence, deep learning, and computer vision algorithms to detect, classify, and track objects within FMV images (e.g., person, vehicle, and weapon) and other AI algorithms for CEM and text based projects. This initiative brings artificial intelligence, deep learning, and computer vision into the process of object detection, identification, and tracking at computer process speed versus human speed. Incorporating computer vision and algorithms will reduce the human burden and provide efficient and effective exploration of data. Project Maven plans to develop algorithms focused on tactical UAV FMV Automatic Target Recognition (ATR) and an operational PED environment for platforms and ground stations. AW will build capabilities, integrate AI and ML to provide actionable intelligence and enhancement to military decision-making by providing algorithms for object detection, classification and user alerts.<br>***FY 2021 OCO Plans:***<br>N/A<br>***FY 2020 to FY 2021 Increase/Decrease Statement:***<br>Funds were transferred from BA-6 to BA-8 Software and Digital Technology Pilot programs. The increase in FY21 is the Department's realization of the importance of AI in support of the NDS. | | | | | |
| **Accomplishments/Planned Programs Subtotals** | 0.000 | 0.000 | 250.107 | 0.000 | 250.107 |

| Exhibit R-2A, RDT&E Project Justification: PB 2021 Office of the Secretary Of Defense | | Date: February 2020 |
|---|---|---|
| **Appropriation/Budget Activity**<br>0400 / 8 | **R-1 Program Element (Number/Name)**<br>PE 0308588D8Z / *Algorithmic Warfare Cross Functional Teams - Software Pilot Program* | **Project (Number/Name)**<br>925 / *Algorithmic Warfare Cross Functional Teams - Software Pilot Program* |

**C. Other Program Funding Summary ($ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

AWCFT's contracting strategy follows guidance outlined in the DoD 5000 series directives, Federal Acquisition Regulation (FAR), Defense Federal Acquisition Regulation (DFAR) and rapid prototyping policies and procedures. Management uses project management tools and meetings to ensure delivery of stated capabilities and performance criteria are achieved.

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