Department of Defense
Fiscal Year (FY) 2022 Budget Estimates

May 2021

Office of the Secretary Of Defense

Defense-Wide Justification Book Volume 3 of 5

Research, Development, Test & Evaluation, Defense-Wide

THIS PAGE INTENTIONALLY LEFT BLANK

Table of Volumes

Defense Advanced Research Projects Agency..... Volume 1
Missile Defense Agency..... Volume 2
Office of the Secretary Of Defense..... Volume 3
Chemical and Biological Defense Program.....Volume 4
Defense Contract Audit Agency..... Volume 5
Defense Contract Management Agency..... Volume 5
Defense Counterintelligence and Security Agency.....Volume 5
Defense Information Systems Agency.....Volume 5
Defense Logistics Agency.....Volume 5
Defense Security Cooperation Agency.....Volume 5
Defense Technical Information Center.....Volume 5
Defense Threat Reduction Agency.....Volume 5
DoD Human Resources Activity..... Volume 5
Operational Test and Evaluation, Defense..... Volume 5
Space Development Agency..... Volume 5
The Joint Staff..... Volume 5

United States Special Operations Command.....Volume 5

Washington Headquarters Services.....Volume 5

Volume 3 Table of Contents

Introduction and Explanation of Contents.....Volume 3 - v

Comptroller Exhibit R-1..... Volume 3 - vii

Program Element Table of Contents (by Budget Activity then Line Item Number).....Volume 3 - xxiii

Program Element Table of Contents (Alphabetically by Program Element Title).....Volume 3 - xxxi

Exhibit R-2s.....Volume 3 - 1

THIS PAGE INTENTIONALLY LEFT BLANK

Footnotes

FY 2020 Actuals

Includes Division A, Title IX and X of the Consolidated Appropriations Act, 2020 (P.L. 116-93), Division F, Title IV and V from the Further Consolidated Appropriations Act, 2020 (P.L. 116-94) and the Coronavirus Aid, Relief, and Economic Security Act (P.L. 116-136).

FY 2021 Enacted

Includes Division C, Title IX and Division J, Title IV of the Consolidated Appropriations Act, 2021 (P.L. 116-260).

THIS PAGE INTENTIONALLY LEFT BLANK

Department of Defense
FY 2022 President's Budget
Exhibit R-1 FY 2022 President's Budget
Total Obligational Authority
(Dollars in Thousands)

04 May 2021

Appropriation	FY 2020 Actual*	FY 2021 Enacted**	FY 2022 Request
Research, Development, Test & Eval, DW	5,966,762	5,598,733	5,234,677
Total Research, Development, Test & Evaluation	5,966,762	5,598,733	5,234,677

R-122BAS: FY 2022 President's Budget (Total Base Published Version), as of May 4, 2021 at 09:22:57

Department of Defense
FY 2022 President's Budget
Exhibit R-1 FY 2022 President's Budget
Total Obligational Authority
(Dollars in Thousands)

04 May 2021

Summary Recap of Budget Activities	FY 2020 Actual*	FY 2021 Enacted**	FY 2022 Request
Basic Research	258,311	293,976	198,549
Applied Research	161,913	171,097	234,194
Advanced Technology Development	1,537,841	1,422,845	1,372,669
Advanced Component Development & Prototypes	2,201,291	2,050,276	1,961,731
System Development & Demonstration	431,511	316,428	184,873
Management Support	1,179,157	831,430	871,214
Operational Systems Development	196,738	265,900	145,688
Software And Digital Technology Pilot Programs		246,781	265,759
Total Research, Development, Test & Evaluation	5,966,762	5,598,733	5,234,677

Summary Recap of FYDP Programs			
General Purpose Forces	7,775	3,099	2,925
Intelligence and Communications	433,119	332,600	339,672
Research and Development	5,524,902	5,263,034	4,892,080
Administration and Associated Activities	966		
Total Research, Development, Test & Evaluation	5,966,762	5,598,733	5,234,677

Defense-Wide
FY 2022 President's Budget
Exhibit R-1 FY 2022 President's Budget
Total Obligational Authority
(Dollars in Thousands)

04 May 2021

Summary Recap of Budget Activities	FY 2020 Actual*	FY 2021 Enacted**	FY 2022 Request
Basic Research	258,311	293,976	198,549
Applied Research	161,913	171,097	234,194
Advanced Technology Development	1,537,841	1,422,845	1,372,669
Advanced Component Development & Prototypes	2,201,291	2,050,276	1,961,731
System Development & Demonstration	431,511	316,428	184,873
Management Support	1,179,157	831,430	871,214
Operational Systems Development	196,738	265,900	145,688
Software And Digital Technology Pilot Programs		246,781	265,759
Total Research, Development, Test & Evaluation	5,966,762	5,598,733	5,234,677

Summary Recap of FYDP Programs			
General Purpose Forces	7,775	3,099	2,925
Intelligence and Communications	433,119	332,600	339,672
Research and Development	5,524,902	5,263,034	4,892,080
Administration and Associated Activities	966		
Total Research, Development, Test & Evaluation	5,966,762	5,598,733	5,234,677

R-122BAS: FY 2022 President's Budget (Total Base Published Version), as of May 4, 2021 at 09:22:57

Defense-Wide
FY 2022 President's Budget
Exhibit R-1 FY 2022 President's Budget
Total Obligational Authority
(Dollars in Thousands)

04 May 2021

Appropriation	FY 2020 Actual*	FY 2021 Enacted**	FY 2022 Request
Office of Secretary of Defense	5,966,762	5,598,733	5,234,677
Total Research, Development, Test & Evaluation	5,966,762	5,598,733	5,234,677

R-122BAS: FY 2022 President's Budget (Total Base Published Version), as of May 4, 2021 at 09:22:57

Defense-Wide
FY 2022 President's Budget
Exhibit R-1 FY 2022 President's Budget
Total Obligational Authority
(Dollars in Thousands)

04 May 2021

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

Line No	Program Element Number	Item	Act	FY 2020 Actual*	FY 2021 Enacted**	FY 2022 Request	Sec
3	0601108D8Z	High Energy Laser Research Initiatives	01			15,390	U
4	0601110D8Z	Basic Research Initiatives	01	68,534	75,542	39,828	U
6	0601120D8Z	National Defense Education Program	01	139,002	137,154	112,195	U
7	0601228D8Z	Historically Black Colleges and Universities/Minority Institutions	01	50,775	81,280	31,136	U
		Basic Research		258,311	293,976	198,549	
9	0602000D8Z	Joint Munitions Technology	02	19,092	24,397	19,591	U
12	0602230D8Z	Defense Technology Innovation	02		17,476	22,918	U
13	0602234D8Z	Lincoln Laboratory Research Program	02	50,685	41,053	55,692	U
14	0602251D8Z	Applied Research for the Advancement of S&T Priorities	02	58,450	53,359	65,015	U
18	0602668D8Z	Cyber Security Research	02	24,454	25,245	15,380	U
23	0602751D8Z	Software Engineering Institute (SEI) Applied Research	02	9,232	9,567	9,601	U
24	0602890D8Z	High Energy Laser Research	02			45,997	U
		Applied Research		161,913	171,097	234,194	
26	0603000D8Z	Joint Munitions Advanced Technology	03	25,399	22,905	23,213	U
27	0603121D8Z	SO/LIC Advanced Development	03	4,847	4,904	4,665	U
28	0603122D8Z	Combating Terrorism Technology Support	03	113,445	144,847	69,376	U
29	0603133D8Z	Foreign Comparative Testing	03	24,510	25,115	25,432	U
34	0603183D8Z	Joint Hypersonic Technology Development &Transition	03			51,340	U
35	0603225D8Z	Joint DoD-DoE Munitions Technology Development	03	18,681	18,861	19,063	U
38	0603288D8Z	Analytic Assessments	03	17,807	19,775	24,012	U
39	0603289D8Z	Advanced Innovative Analysis and Concepts	03	36,801	28,524	51,513	U

R-122BAS: FY 2022 President's Budget (Total Base Published Version), as of May 4, 2021 at 09:22:57

Defense-Wide
FY 2022 President's Budget
Exhibit R-1 FY 2022 President's Budget
Total Obligational Authority
(Dollars in Thousands)

04 May 2021

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

Line No	Program Element Number	Item	Act	FY 2020 Actual*	FY 2021 Enacted**	FY 2022 Request	Sec
40	0603291D8Z	Advanced Innovative Analysis and Concepts - MHA	03	14,339	14,703		U
42	0603338D8Z	Defense Modernization and Prototyping	03		155,505	115,443	U
43	0603342D8Z	Defense Innovation Unit (DIU)	03	29,268	35,617	31,873	U
44	0603375D8Z	Technology Innovation	03	29,009	27,693	54,433	U
46	0603527D8Z	RETRACT LARCH	03	154,415	130,220	99,175	U
47	0603618D8Z	Joint Electronic Advanced Technology	03	11,762	15,152	18,221	U
48	0603648D8Z	Joint Capability Technology Demonstrations	03	87,384	71,452	102,669	U
49	0603662D8Z	Networked Communications Capabilities	03	2,767	5,882	2,984	U
50	0603680D8Z	Defense-Wide Manufacturing Science and Technology Program	03	251,516	245,757	134,022	U
52	0603699D8Z	Emerging Capabilities Technology Development	03	105,998			U
54	0603716D8Z	Strategic Environmental Research Program	03	69,914	85,429	51,863	U
56	0603727D8Z	Joint Warfighting Program	03	4,532	3,869	2,169	U
61	0603769D8Z	Distributed Learning Advanced Technology Development	03	21,991	6,765	6,398	U
62	0603781D8Z	Software Engineering Institute	03	14,556	12,590	14,677	U
63	0603826D8Z	Quick Reaction Special Projects	03	34,457			U
64	0603833D8Z	Engineering Science & Technology	03	18,900			U
65	0603924D8Z	High Energy Laser Advanced Technology Program	03	78,057	112,842	107,397	U
66	0603941D8Z	Test & Evaluation Science & Technology	03	186,017	178,438	267,161	U
67	0603950D8Z	National Security Innovation Network	03	37,658	40,000	21,270	U
68	0604055D8Z	Operational Energy Capability Improvement	03	62,686	16,000	74,300	U
69	0303310D8Z	CWMD Systems	03	27,878			U

R-122BAS: FY 2022 President's Budget (Total Base Published Version), as of May 4, 2021 at 09:22:57

Defense-Wide
FY 2022 President's Budget
Exhibit R-1 FY 2022 President's Budget
Total Obligational Authority
(Dollars in Thousands)

04 May 2021

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

Line No	Program Element Number	Item	Act	FY 2020 Actual*	FY 2021 Enacted**	FY 2022 Request	Sec
70	0303367D8Z	Spectrum Access Research and Development	03	53,247			U
		Advanced Technology Development		1,537,841	1,422,845	1,372,669	
74	0603161D8Z	Nuclear and Conventional Physical Security Equipment RDT&E ADC&P	04	41,768	32,616	28,687	U
75	0603600D8Z	WALKOFF	04	90,404	101,529	108,652	U
76	0603821D8Z	Acquisition Enterprise Data & Information Services	04	5,293			U
77	0603851D8Z	Environmental Security Technical Certification Program	04	65,016	73,307	71,429	U
93	0603920D8Z	Humanitarian Demining	04	14,294			U
94	0603923D8Z	Coalition Warfare	04	11,159	10,123	5,103	U
95	0604011D8Z	Next Generation Information Communications Technology (5G)	04	199,965	439,769	374,665	U
96	0604016D8Z	Department of Defense Corrosion Program	04	13,032	5,323	3,259	U
99	0604132D8Z	Missile Defeat Project	04	14,288			U
102	0604250D8Z	Advanced Innovative Technologies	04	1,106,137	749,030	716,456	U
103	0604294D8Z	Trusted & Assured Microelectronics	04	534,340	503,750	509,195	U
104	0604331D8Z	Rapid Prototyping Program	04	70,227	92,023	103,575	U
105	0604341D8Z	Defense Innovation Unit (DIU) Prototyping	04	22,000	31,255	11,213	U
106	0604400D8Z	Department of Defense (DoD) Unmanned System Common Development	04	6,565	7,085	2,778	U
108	0604555D8Z	Operational Energy Capability Improvement - Non S&T	04			23,200	U
111	0604682D8Z	Wargaming and Support for Strategic Analysis (SSA)	04	3,613	3,469	3,519	U
122	0303191D8Z	Joint Electromagnetic Technology (JET) Program	04	3,190	997		U
		Advanced Component Development & Prototypes		2,201,291	2,050,276	1,961,731	
127	0604161D8Z	Nuclear and Conventional Physical Security Equipment RDT&E SDD	05	7,810	7,169	5,682	U

R-122BAS: FY 2022 President's Budget (Total Base Published Version), as of May 4, 2021 at 09:22:57

Defense-Wide
FY 2022 President's Budget
Exhibit R-1 FY 2022 President's Budget
Total Obligational Authority
(Dollars in Thousands)

04 May 2021

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

Line No	Program Element Number	Item	Act	FY 2020 Actual*	FY 2021 Enacted**	FY 2022 Request	Sec
128	0604165D8Z	Prompt Global Strike Capability Development	05	152,782	89,863		U
130	0604771D8Z	Joint Tactical Information Distribution System (JTIDS)	05	52,059	51,284	9,345	U
134	0605022D8Z	Defense Exportability Program	05	11,864	12,920	5,447	U
135	0605027D8Z	OUSD(C) IT Development Initiatives	05	9,238	10,259	16,892	U
137	0605075D8Z	CMO Policy and Integration	05	1,618	1,618		U
141	0605210D8Z	Defense-Wide Electronic Procurement Capabilities	05	8,995	8,274	7,148	U
142	0605294D8Z	Trusted & Assured Microelectronics	05	170,849	107,513	113,895	U
144	0605772D8Z	Nuclear Command, Control, & Communications	05		3,683	3,991	U
147	0305304D8Z	DoD Enterprise Energy Information Management (EEIM)	05	4,537	3,273	2,227	U
148	0305310D8Z	CWMD Systems: System Development and Demonstration	05	11,759	20,572	20,246	U
		System Development & Demonstration		431,511	316,428	184,873	
150	0604774D8Z	Defense Readiness Reporting System (DRRS)	06	9,722	9,793	7,508	U
151	0604875D8Z	Joint Systems Architecture Development	06	8,971	8,492	7,859	U
152	0604940D8Z	Central Test and Evaluation Investment Development (CTEIP)	06	381,356	423,206	550,140	U
153	0604942D8Z	Assessments and Evaluations	06	30,064	18,368	17,980	U
155	0605100D8Z	Joint Mission Environment Test Capability (JMETC)	06	87,776	79,046	71,410	U
156	0605104D8Z	Technical Studies, Support and Analysis	06	17,088			U
158	0605128D8Z	Classified Program USD(P)	06	104,000	110,000		U
159	0605142D8Z	Systems Engineering	06	35,860	45,626	40,030	U
160	0605151D8Z	Studies and Analysis Support - OSD	06	4,611	5,777	4,612	U
161	0605161D8Z	Nuclear Matters-Physical Security	06	7,803	16,542	14,429	U

R-122BAS: FY 2022 President's Budget (Total Base Published Version), as of May 4, 2021 at 09:22:57

Defense-Wide
FY 2022 President's Budget
Exhibit R-1 FY 2022 President's Budget
Total Obligational Authority
(Dollars in Thousands)

04 May 2021

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

Line No	Program Element Number	Item	Act	FY 2020 Actual*	FY 2021 Enacted**	FY 2022 Request	Sec
162	0605170D8Z	Support to Networks and Information Integration	06	7,295	9,582	4,759	U
163	0605200D8Z	General Support to USD (Intelligence)	06	20,196	7,904	1,952	U
167	0605502D8Z	Small Business Innovative Research	06	133,393			U
170	0605790D8Z	Small Business Innovation Research (SBIR)/ Small Business Technology Transfer	06	3,567	3,582	3,639	U
171	0605797D8Z	Maintaining Technology Advantage	06	20,244	25,561	25,889	U
172	0605798D8Z	Defense Technology Analysis	06	15,334	23,341	39,774	U
175	0605804D8Z	Development Test and Evaluation	06	21,422	27,198	27,366	U
178	0606100D8Z	Budget and Program Assessments	06	8,723	10,099	15,438	U
179	0606225D8Z	ODNA Technology and Resource Analysis	06	3,193	3,200	2,897	U
181	0606771D8Z	Cyber Resiliency and Cybersecurity Policy	06			31,638	U
182	0203345D8Z	Defense Operations Security Initiative (DOSI)	06	7,775	3,099	2,925	U
189	0303260D8Z	Defense Military Deception Program Office (DMDPO)	06	984	1,014	969	U
193	0305245D8Z	Intelligence Capabilities and Innovation Investments	06	15,868			U
194	0307588D8Z	Algorithmic Warfare Cross Functional Teams	06	232,946			U
199	0909999D8Z	Financing for Cancelled Account Adjustments	06	966			U
		Management Support		1,179,157	831,430	871,214	
204	0607210D8Z	Industrial Base Analysis and Sustainment Support	07	101,760	172,145	58,189	U
205	0607310D8Z	CWMD Systems: Operational Systems Development	07	12,268	16,954	18,721	U
217	0303140D8Z	Information Systems Security Program	07	51,876	46,529	49,191	U
235	0305186D8Z	Policy R&D Programs	07	6,231	6,291	4,843	U
236	0305199D8Z	Net Centricity	07	22,400	21,793	13,471	U

R-122BAS: FY 2022 President's Budget (Total Base Published Version), as of May 4, 2021 at 09:22:57

Defense-Wide
FY 2022 President's Budget
Exhibit R-1 FY 2022 President's Budget
Total Obligational Authority
(Dollars in Thousands)

04 May 2021

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

Line No	Program Element Number	Item	Act	FY 2020 Actual*	FY 2021 Enacted**	FY 2022 Request	Sec
245	0305387D8Z	Homeland Defense Technology Transfer Program	07	2,203	2,188	1,273	U
		Operational Systems Development		196,738	265,900	145,688	
272	0608648D8Z	Acquisition Visibility - Software Pilot Program	08		16,838	18,307	U
274	0308588D8Z	Algorithmic Warfare Cross Functional Teams - Software Pilot Program	08		229,943	247,452	U
		Software And Digital Technology Pilot Programs			246,781	265,759	
Total Research, Development, Test & Eval, DW				5,966,762	5,598,733	5,234,677	

Office of Secretary of Defense
FY 2022 President's Budget
Exhibit R-1 FY 2022 President's Budget
Total Obligational Authority
(Dollars in Thousands)

04 May 2021

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

Line No	Program Element Number	Item	Act	FY 2020 Actual*	FY 2021 Enacted**	FY 2022 Request	Sec
3	0601108D8Z	High Energy Laser Research Initiatives	01			15,390	U
4	0601110D8Z	Basic Research Initiatives	01	68,534	75,542	39,828	U
6	0601120D8Z	National Defense Education Program	01	139,002	137,154	112,195	U
7	0601228D8Z	Historically Black Colleges and Universities/Minority Institutions	01	50,775	81,280	31,136	U
		Basic Research		258,311	293,976	198,549	
9	0602000D8Z	Joint Munitions Technology	02	19,092	24,397	19,591	U
12	0602230D8Z	Defense Technology Innovation	02		17,476	22,918	U
13	0602234D8Z	Lincoln Laboratory Research Program	02	50,685	41,053	55,692	U
14	0602251D8Z	Applied Research for the Advancement of S&T Priorities	02	58,450	53,359	65,015	U
18	0602668D8Z	Cyber Security Research	02	24,454	25,245	15,380	U
23	0602751D8Z	Software Engineering Institute (SEI) Applied Research	02	9,232	9,567	9,601	U
24	0602890D8Z	High Energy Laser Research	02			45,997	U
		Applied Research		161,913	171,097	234,194	
26	0603000D8Z	Joint Munitions Advanced Technology	03	25,399	22,905	23,213	U
27	0603121D8Z	SO/LIC Advanced Development	03	4,847	4,904	4,665	U
28	0603122D8Z	Combating Terrorism Technology Support	03	113,445	144,847	69,376	U
29	0603133D8Z	Foreign Comparative Testing	03	24,510	25,115	25,432	U
34	0603183D8Z	Joint Hypersonic Technology Development &Transition	03			51,340	U
35	0603225D8Z	Joint DoD-DoE Munitions Technology Development	03	18,681	18,861	19,063	U
38	0603288D8Z	Analytic Assessments	03	17,807	19,775	24,012	U
39	0603289D8Z	Advanced Innovative Analysis and Concepts	03	36,801	28,524	51,513	U

R-122BAS: FY 2022 President's Budget (Total Base Published Version), as of May 4, 2021 at 09:22:57

Office of Secretary of Defense
FY 2022 President's Budget
Exhibit R-1 FY 2022 President's Budget
Total Obligational Authority
(Dollars in Thousands)

04 May 2021

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

Line No	Program Element Number	Item	Act	FY 2020 Actual*	FY 2021 Enacted**	FY 2022 Request	Sec
40	0603291D8Z	Advanced Innovative Analysis and Concepts - MHA	03	14,339	14,703		U
42	0603338D8Z	Defense Modernization and Prototyping	03		155,505	115,443	U
43	0603342D8Z	Defense Innovation Unit (DIU)	03	29,268	35,617	31,873	U
44	0603375D8Z	Technology Innovation	03	29,009	27,693	54,433	U
46	0603527D8Z	RETRACT LARCH	03	154,415	130,220	99,175	U
47	0603618D8Z	Joint Electronic Advanced Technology	03	11,762	15,152	18,221	U
48	0603648D8Z	Joint Capability Technology Demonstrations	03	87,384	71,452	102,669	U
49	0603662D8Z	Networked Communications Capabilities	03	2,767	5,882	2,984	U
50	0603680D8Z	Defense-Wide Manufacturing Science and Technology Program	03	251,516	245,757	134,022	U
52	0603699D8Z	Emerging Capabilities Technology Development	03	105,998			U
54	0603716D8Z	Strategic Environmental Research Program	03	69,914	85,429	51,863	U
56	0603727D8Z	Joint Warfighting Program	03	4,532	3,869	2,169	U
61	0603769D8Z	Distributed Learning Advanced Technology Development	03	21,991	6,765	6,398	U
62	0603781D8Z	Software Engineering Institute	03	14,556	12,590	14,677	U
63	0603826D8Z	Quick Reaction Special Projects	03	34,457			U
64	0603833D8Z	Engineering Science & Technology	03	18,900			U
65	0603924D8Z	High Energy Laser Advanced Technology Program	03	78,057	112,842	107,397	U
66	0603941D8Z	Test & Evaluation Science & Technology	03	186,017	178,438	267,161	U
67	0603950D8Z	National Security Innovation Network	03	37,658	40,000	21,270	U
68	0604055D8Z	Operational Energy Capability Improvement	03	62,686	16,000	74,300	U
69	0303310D8Z	CWMD Systems	03	27,878			U

R-122BAS: FY 2022 President's Budget (Total Base Published Version), as of May 4, 2021 at 09:22:57

Office of Secretary of Defense
FY 2022 President's Budget
Exhibit R-1 FY 2022 President's Budget
Total Obligational Authority
(Dollars in Thousands)

04 May 2021

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

Line No	Program Element Number	Item	Act	FY 2020 Actual*	FY 2021 Enacted**	FY 2022 Request	Sec
70	0303367D8Z	Spectrum Access Research and Development	03	53,247			U
		Advanced Technology Development		1,537,841	1,422,845	1,372,669	
74	0603161D8Z	Nuclear and Conventional Physical Security Equipment RDT&E ADC&P	04	41,768	32,616	28,687	U
75	0603600D8Z	WALKOFF	04	90,404	101,529	108,652	U
76	0603821D8Z	Acquisition Enterprise Data & Information Services	04	5,293			U
77	0603851D8Z	Environmental Security Technical Certification Program	04	65,016	73,307	71,429	U
93	0603920D8Z	Humanitarian Demining	04	14,294			U
94	0603923D8Z	Coalition Warfare	04	11,159	10,123	5,103	U
95	0604011D8Z	Next Generation Information Communications Technology (5G)	04	199,965	439,769	374,665	U
96	0604016D8Z	Department of Defense Corrosion Program	04	13,032	5,323	3,259	U
99	0604132D8Z	Missile Defeat Project	04	14,288			U
102	0604250D8Z	Advanced Innovative Technologies	04	1,106,137	749,030	716,456	U
103	0604294D8Z	Trusted & Assured Microelectronics	04	534,340	503,750	509,195	U
104	0604331D8Z	Rapid Prototyping Program	04	70,227	92,023	103,575	U
105	0604341D8Z	Defense Innovation Unit (DIU) Prototyping	04	22,000	31,255	11,213	U
106	0604400D8Z	Department of Defense (DoD) Unmanned System Common Development	04	6,565	7,085	2,778	U
108	0604555D8Z	Operational Energy Capability Improvement - Non S&T	04			23,200	U
111	0604682D8Z	Wargaming and Support for Strategic Analysis (SSA)	04	3,613	3,469	3,519	U
122	0303191D8Z	Joint Electromagnetic Technology (JET) Program	04	3,190	997		U
		Advanced Component Development & Prototypes		2,201,291	2,050,276	1,961,731	
127	0604161D8Z	Nuclear and Conventional Physical Security Equipment RDT&E SDD	05	7,810	7,169	5,682	U

R-122BAS: FY 2022 President's Budget (Total Base Published Version), as of May 4, 2021 at 09:22:57

Office of Secretary of Defense
FY 2022 President's Budget
Exhibit R-1 FY 2022 President's Budget
Total Obligational Authority
(Dollars in Thousands)

04 May 2021

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

Line No	Program Element Number	Item	Act	FY 2020 Actual*	FY 2021 Enacted**	FY 2022 Request	Sec
128	0604165D8Z	Prompt Global Strike Capability Development	05	152,782	89,863		U
130	0604771D8Z	Joint Tactical Information Distribution System (JTIDS)	05	52,059	51,284	9,345	U
134	0605022D8Z	Defense Exportability Program	05	11,864	12,920	5,447	U
135	0605027D8Z	OUSD(C) IT Development Initiatives	05	9,238	10,259	16,892	U
137	0605075D8Z	CMO Policy and Integration	05	1,618	1,618		U
141	0605210D8Z	Defense-Wide Electronic Procurement Capabilities	05	8,995	8,274	7,148	U
142	0605294D8Z	Trusted & Assured Microelectronics	05	170,849	107,513	113,895	U
144	0605772D8Z	Nuclear Command, Control, & Communications	05		3,683	3,991	U
147	0305304D8Z	DoD Enterprise Energy Information Management (EEIM)	05	4,537	3,273	2,227	U
148	0305310D8Z	CWMD Systems: System Development and Demonstration	05	11,759	20,572	20,246	U
		System Development & Demonstration		431,511	316,428	184,873	
150	0604774D8Z	Defense Readiness Reporting System (DRRS)	06	9,722	9,793	7,508	U
151	0604875D8Z	Joint Systems Architecture Development	06	8,971	8,492	7,859	U
152	0604940D8Z	Central Test and Evaluation Investment Development (CTEIP)	06	381,356	423,206	550,140	U
153	0604942D8Z	Assessments and Evaluations	06	30,064	18,368	17,980	U
155	0605100D8Z	Joint Mission Environment Test Capability (JMETC)	06	87,776	79,046	71,410	U
156	0605104D8Z	Technical Studies, Support and Analysis	06	17,088			U
158	0605128D8Z	Classified Program USD(P)	06	104,000	110,000		U
159	0605142D8Z	Systems Engineering	06	35,860	45,626	40,030	U
160	0605151D8Z	Studies and Analysis Support - OSD	06	4,611	5,777	4,612	U
161	0605161D8Z	Nuclear Matters-Physical Security	06	7,803	16,542	14,429	U

R-122BAS: FY 2022 President's Budget (Total Base Published Version), as of May 4, 2021 at 09:22:57

Office of Secretary of Defense
FY 2022 President's Budget
Exhibit R-1 FY 2022 President's Budget
Total Obligational Authority
(Dollars in Thousands)

04 May 2021

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

Line No	Program Element Number	Item	Act	FY 2020 Actual*	FY 2021 Enacted**	FY 2022 Request	Sec
162	0605170D8Z	Support to Networks and Information Integration	06	7,295	9,582	4,759	U
163	0605200D8Z	General Support to USD (Intelligence)	06	20,196	7,904	1,952	U
167	0605502D8Z	Small Business Innovative Research	06	133,393			U
170	0605790D8Z	Small Business Innovation Research (SBIR)/ Small Business Technology Transfer	06	3,567	3,582	3,639	U
171	0605797D8Z	Maintaining Technology Advantage	06	20,244	25,561	25,889	U
172	0605798D8Z	Defense Technology Analysis	06	15,334	23,341	39,774	U
175	0605804D8Z	Development Test and Evaluation	06	21,422	27,198	27,366	U
178	0606100D8Z	Budget and Program Assessments	06	8,723	10,099	15,438	U
179	0606225D8Z	ODNA Technology and Resource Analysis	06	3,193	3,200	2,897	U
181	0606771D8Z	Cyber Resiliency and Cybersecurity Policy	06			31,638	U
182	0203345D8Z	Defense Operations Security Initiative (DOSI)	06	7,775	3,099	2,925	U
189	0303260D8Z	Defense Military Deception Program Office (DMDPO)	06	984	1,014	969	U
193	0305245D8Z	Intelligence Capabilities and Innovation Investments	06	15,868			U
194	0307588D8Z	Algorithmic Warfare Cross Functional Teams	06	232,946			U
199	0909999D8Z	Financing for Cancelled Account Adjustments	06	966			U
		Management Support		1,179,157	831,430	871,214	
204	0607210D8Z	Industrial Base Analysis and Sustainment Support	07	101,760	172,145	58,189	U
205	0607310D8Z	CWMD Systems: Operational Systems Development	07	12,268	16,954	18,721	U
217	0303140D8Z	Information Systems Security Program	07	51,876	46,529	49,191	U
235	0305186D8Z	Policy R&D Programs	07	6,231	6,291	4,843	U
236	0305199D8Z	Net Centricity	07	22,400	21,793	13,471	U

R-122BAS: FY 2022 President's Budget (Total Base Published Version), as of May 4, 2021 at 09:22:57

Office of Secretary of Defense
FY 2022 President's Budget
Exhibit R-1 FY 2022 President's Budget
Total Obligational Authority
(Dollars in Thousands)

04 May 2021

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

Line No	Program Element Number	Item	Act	FY 2020 Actual*	FY 2021 Enacted**	FY 2022 Request	Sec
245	0305387D8Z	Homeland Defense Technology Transfer Program	07	2,203	2,188	1,273	U
		Operational Systems Development		196,738	265,900	145,688	
272	0608648D8Z	Acquisition Visibility - Software Pilot Program	08		16,838	18,307	U
274	0308588D8Z	Algorithmic Warfare Cross Functional Teams - Software Pilot Program	08		229,943	247,452	U
		Software And Digital Technology Pilot Programs			246,781	265,759	
		Total Office of Secretary of Defense		5,966,762	5,598,733	5,234,677	

R-122BAS: FY 2022 President's Budget (Total Base Published Version), as of May 4, 2021 at 09:22:57

Program Element Table of Contents (by Budget Activity then Line Item Number)

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

Line #	Budget Activity	Program Element Number	Program Element Title	Page
3	01	0601108D8Z	High Energy Laser Research Initiatives	Volume 3 - 1
4	01	0601110D8Z	Basic Research Initiatives	Volume 3 - 5
6	01	0601120D8Z	National Defense Education Program (NDEP)	Volume 3 - 15
7	01	0601228D8Z	Historically Black Colleges and Universities and Minority-Serving Institutions	Volume 3 - 23

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

Line #	Budget Activity	Program Element Number	Program Element Title	Page
9	02	0602000D8Z	Joint Munitions Technology	Volume 3 - 29
12	02	0602230D8Z	Defense Technology Innovation	Volume 3 - 39
13	02	0602234D8Z	Lincoln Laboratory	Volume 3 - 45
14	02	0602251D8Z	Applied Research for the Advancement of S&T Priorities	Volume 3 - 59
18	02	0602668D8Z	Cyber Security Research	Volume 3 - 67
23	02	0602751D8Z	Software Engineering Institute (SEI) Applied Research	Volume 3 - 73

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

Line #	Budget Activity	Program Element Number	Program Element Title	Page
24	02	0602890D8Z	High Energy Laser Development	Volume 3 - 79

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

Line #	Budget Activity	Program Element Number	Program Element Title	Page
26	03	0603000D8Z	Joint Munitions Advanced Technology	Volume 3 - 85
27	03	0603121D8Z	SO/LIC Advanced Development	Volume 3 - 97
28	03	0603122D8Z	Combating Terrorism Technology Support	Volume 3 - 101
29	03	0603133D8Z	Foreign Comparative Testing	Volume 3 - 131
34	03	0603183D8Z	Joint Hypersonic Technology Development & Transition	Volume 3 - 155
35	03	0603225D8Z	Joint DOD/DOE Munitions Technology Development	Volume 3 - 165
38	03	0603288D8Z	Science and Technology (S&T) Analytic Assessments	Volume 3 - 169
39	03	0603289D8Z	Advanced Innovative Analysis and Concepts	Volume 3 - 177
40	03	0603291D8Z	Advanced Innovative Analysis & Concepts - MHA	Volume 3 - 181
42	03	0603338D8Z	Defense Modernization and Prototyping	Volume 3 - 185
43	03	0603342D8Z	Defense Innovation Unit (DIU)	Volume 3 - 209
44	03	0603375D8Z	Technology Innovation	Volume 3 - 217

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

Line #	Budget Activity	Program Element Number	Program Element Title	Page
46	03	0603527D8Z	Retract Larch	Volume 3 - 225
47	03	0603618D8Z	Joint Electronic Advanced Technology	Volume 3 - 227
48	03	0603648D8Z	Joint Capability Technology Demonstration (JCTD)	Volume 3 - 235
49	03	0603662D8Z	Networked Communications Capability	Volume 3 - 255
50	03	0603680D8Z	Defense Wide Manufacturing Science and Technology Program	Volume 3 - 261
52	03	0603699D8Z	Emerging Capabilities Technology Development	Volume 3 - 283
54	03	0603716D8Z	Strategic Environmental Research and Development Program (SERDP)	Volume 3 - 295
56	03	0603727D8Z	Joint Warfighting Program (JWP)	Volume 3 - 299
61	03	0603769D8Z	Advanced Distributed Learning	Volume 3 - 307
62	03	0603781D8Z	Software Engineering Institute (SEI)	Volume 3 - 311
63	03	0603826D8Z	Quick Reaction Special Projects (QRSP)	Volume 3 - 317
64	03	0603833D8Z	Engineering Science and Technology (S&T)	Volume 3 - 327
65	03	0603924D8Z	High Energy Laser Advanced Development	Volume 3 - 335
66	03	0603941D8Z	Test and Evaluation/Science and Technology	Volume 3 - 341
67	03	0603950D8Z	National Security Innovation Network	Volume 3 - 371
68	03	0604055D8Z	Operational Energy Capability Improvement (OECI)	Volume 3 - 377
69	03	0303310D8Z	Countering Weapons of Mass Destruction (CWMD) Systems: Advanced Technology Development	Volume 3 - 383
70	03	0303367D8Z	Spectrum Access Research and Development	Volume 3 - 387

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

Line #	Budget Activity	Program Element Number	Program Element Title	Page
74	04	0603161D8Z	Nuclear and Conventional Physical Security/National Technical Nuclear Forensics	Volume 3 - 389
75	04	0603600D8Z	WALKOFF	Volume 3 - 419
76	04	0603821D8Z	Acquisition Enterprise Data & Information Services	Volume 3 - 425
77	04	0603851D8Z	Environmental Security Technology Certification Program (ESTCP)	Volume 3 - 431
93	04	0603920D8Z	Humanitarian De-mining	Volume 3 - 439
94	04	0603923D8Z	Coalition Warfare Program (CWP)	Volume 3 - 447
95	04	0604011D8Z	Next Generation ICT (5G)	Volume 3 - 455
96	04	0604016D8Z	Department of Defense Corrosion Program	Volume 3 - 471
99	04	0604132D8Z	Missile Defeat Project	Volume 3 - 481
102	04	0604250D8Z	Advanced Innovative Technologies	Volume 3 - 487
103	04	0604294D8Z	Trusted and Assured Microelectronics	Volume 3 - 517
104	04	0604331D8Z	Rapid Prototyping Program	Volume 3 - 569
105	04	0604341D8Z	DIU Prototyping	Volume 3 - 581
106	04	0604400D8Z	Department of Defense (DoD) Unmanned Systems Common Development	Volume 3 - 595
108	04	0604555D8Z	Operational Energy Prototyping (OEP)	Volume 3 - 613
111	04	0604682D8Z	Wargaming & Support for Strategic Analysis (SSA)	Volume 3 - 621

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

Line #	Budget Activity	Program Element Number	Program Element Title	Page
122	04	0303191D8Z	Joint Electromagnetic Technology (JET) Program	Volume 3 - 627

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

Line #	Budget Activity	Program Element Number	Program Element Title	Page
127	05	0604161D8Z	Nuclear and Conventional Physical Security/National Technical Nuclear Forensics	Volume 3 - 633
128	05	0604165D8Z	Prompt Global Strike Capability Development	Volume 3 - 653
130	05	0604771D8Z	Joint Tactical Information Distribution System (JTIDS)	Volume 3 - 673
134	05	0605022D8Z	Defense Exportability Features (DEF) Program	Volume 3 - 697
135	05	0605027D8Z	OUSD(C) IT Development Initiative	Volume 3 - 705
137	05	0605075D8Z	CMO Policy and Integration	Volume 3 - 723
141	05	0605210D8Z	Defense-Wide Electronic Procurement Capabilities	Volume 3 - 729
142	05	0605294D8Z	Trusted and Assured Microelectronics	Volume 3 - 735
144	05	0605772D8Z	Nuclear Command, Control and Communications (NC3)	Volume 3 - 769
147	05	0305304D8Z	DoD Enterprise Energy Information Management (EEIM)	Volume 3 - 777
148	05	0305310D8Z	CWMD Systems: System Development & Demonstration	Volume 3 - 793

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

Line #	Budget Activity	Program Element Number	Program Element Title	Page
150	06	0604774D8Z	Defense Readiness Reporting System (DRRS)	Volume 3 - 803
151	06	0604875D8Z	Joint Systems Architecture Development	Volume 3 - 807
152	06	0604940D8Z	Central Test and Evaluation Investment Program (CTEIP)	Volume 3 - 815
153	06	0604942D8Z	Assessments & Evaluations	Volume 3 - 833
155	06	0605100D8Z	Joint Mission Environment Test Capability (JMETC)	Volume 3 - 837
156	06	0605104D8Z	Technical Studies Support and Analysis	Volume 3 - 847
158	06	0605128D8Z	Classified Program	Volume 3 - 849
159	06	0605142D8Z	Systems Engineering	Volume 3 - 851
160	06	0605151D8Z	Studies and Analysis Support – OSD	Volume 3 - 869
161	06	0605161D8Z	Nuclear Matters	Volume 3 - 873
162	06	0605170D8Z	Support to Networks and Information Integration (NII)	Volume 3 - 883
163	06	0605200D8Z	General Support to OUSD(I)	Volume 3 - 889
167	06	0605502D8Z	Small Business Innovation Research/Small Business Technology Transfer (SBIR/ STTR)	Volume 3 - 893
170	06	0605790D8Z	Small Business Innovation Research (SBIR)/Small Business Technology Transfer (STTR)	Volume 3 - 899
171	06	0605797D8Z	Maintaining Technology Advantage	Volume 3 - 903

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

Line #	Budget Activity	Program Element Number	Program Element Title	Page
172	06	0605798D8Z	Defense Technology Analysis	Volume 3 - 915
175	06	0605804D8Z	Development Test & Evaluation	Volume 3 - 927
178	06	0606100D8Z	Budget and Program Assessments	Volume 3 - 937
179	06	0606225D8Z	ODNA Technology & Resource Analysis	Volume 3 - 943
181	06	0606771D8Z	Cyber Resiliency & Cybersecurity Policy	Volume 3 - 947
182	06	0203345D8Z	Defense Operations Security Initiative (DOSI)	Volume 3 - 951
189	06	0303260D8Z	Defense Military Deception Program Office (DMDPO)	Volume 3 - 955
193	06	0305245D8Z	Intelligence Capabilities and Innovation Investments	Volume 3 - 959
194	06	0307588D8Z	Algorithmic Warfare Cross Functional Team (AWCFT)	Volume 3 - 961

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

Line #	Budget Activity	Program Element Number	Program Element Title	Page
204	07	0607210D8Z	Industrial Base Analysis and Sustainment Support	Volume 3 - 965
205	07	0607310D8Z	CWMD Systems: Operational Systems Development	Volume 3 - 991
217	07	0303140D8Z	Information Systems Security Program	Volume 3 - 999
235	07	0305186D8Z	Policy R&D Programs	Volume 3 - 1007

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

Line #	Budget Activity	Program Element Number	Program Element Title	Page
236	07	0305199D8Z	Net Centricity	Volume 3 - 1015
245	07	0305387D8Z	Homeland Defense Technology Transfer Program	Volume 3 - 1029

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

Line #	Budget Activity	Program Element Number	Program Element Title	Page
272	08	0608648D8Z	Acquisition Visibility - Software Pilot Program	Volume 3 - 1035
274	08	0308588D8Z	Algorithmic Warfare Cross Functional Teams - Software Pilot Program	Volume 3 - 1041

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

Program Element Title	Program Element Number	Line #	BA	Page
Acquisition Enterprise Data & Information Services	0603821D8Z	76	04	Volume 3 - 425
Acquisition Visibility - Software Pilot Program	0608648D8Z	272	08	Volume 3 - 1035
Advanced Distributed Learning	0603769D8Z	61	03	Volume 3 - 307
Advanced Innovative Analysis & Concepts - MHA	0603291D8Z	40	03	Volume 3 - 181
Advanced Innovative Analysis and Concepts	0603289D8Z	39	03	Volume 3 - 177
Advanced Innovative Technologies	0604250D8Z	102	04	Volume 3 - 487
Algorithmic Warfare Cross Functional Team (AWCFT)	0307588D8Z	194	06	Volume 3 - 961
Algorithmic Warfare Cross Functional Teams - Software Pilot Program	0308588D8Z	274	08	Volume 3 - 1041
Applied Research for the Advancement of S&T Priorities	0602251D8Z	14	02	Volume 3 - 59
Assessments & Evaluations	0604942D8Z	153	06	Volume 3 - 833
Basic Research Initiatives	0601110D8Z	4	01	Volume 3 - 5
Budget and Program Assessments	0606100D8Z	178	06	Volume 3 - 937
CMO Policy and Integration	0605075D8Z	137	05	Volume 3 - 723
CWMD Systems: Operational Systems Development	0607310D8Z	205	07	Volume 3 - 991
CWMD Systems: System Development & Demonstration	0305310D8Z	148	05	Volume 3 - 793
Central Test and Evaluation Investment Program (CTEIP)	0604940D8Z	152	06	Volume 3 - 815
Classified Program	0605128D8Z	158	06	Volume 3 - 849

Program Element Title	Program Element Number	Line #	BA	Page
Coalition Warfare Program (CWP)	0603923D8Z	94	04	Volume 3 - 447
Combating Terrorism Technology Support	0603122D8Z	28	03	Volume 3 - 101
Countering Weapons of Mass Destruction (CWMD) Systems: Advanced Technology Development	0303310D8Z	69	03	Volume 3 - 383
Cyber Resiliency & Cybersecurity Policy	0606771D8Z	181	06	Volume 3 - 947
Cyber Security Research	0602668D8Z	18	02	Volume 3 - 67
DIU Prototyping	0604341D8Z	105	04	Volume 3 - 581
Defense Exportability Features (DEF) Program	0605022D8Z	134	05	Volume 3 - 697
Defense Innovation Unit (DIU)	0603342D8Z	43	03	Volume 3 - 209
Defense Military Deception Program Office (DMDPO)	0303260D8Z	189	06	Volume 3 - 955
Defense Modernization and Prototyping	0603338D8Z	42	03	Volume 3 - 185
Defense Operations Security Initiative (DOSI)	0203345D8Z	182	06	Volume 3 - 951
Defense Readiness Reporting System (DRRS)	0604774D8Z	150	06	Volume 3 - 803
Defense Technology Analysis	0605798D8Z	172	06	Volume 3 - 915
Defense Technology Innovation	0602230D8Z	12	02	Volume 3 - 39
Defense Wide Manufacturing Science and Technology Program	0603680D8Z	50	03	Volume 3 - 261
Defense-Wide Electronic Procurement Capabilities	0605210D8Z	141	05	Volume 3 - 729
Department of Defense (DoD) Unmanned Systems Common Development	0604400D8Z	106	04	Volume 3 - 595
Department of Defense Corrosion Program	0604016D8Z	96	04	Volume 3 - 471
Development Test & Evaluation	0605804D8Z	175	06	Volume 3 - 927

Program Element Title	Program Element Number	Line #	BA	Page
DoD Enterprise Energy Information Management (EEIM)	0305304D8Z	147	05	Volume 3 - 777
Emerging Capabilities Technology Development	0603699D8Z	52	03	Volume 3 - 283
Engineering Science and Technology (S&T)	0603833D8Z	64	03	Volume 3 - 327
Environmental Security Technology Certification Program (ESTCP)	0603851D8Z	77	04	Volume 3 - 431
Foreign Comparative Testing	0603133D8Z	29	03	Volume 3 - 131
General Support to OUSD(I)	0605200D8Z	163	06	Volume 3 - 889
High Energy Laser Advanced Development	0603924D8Z	65	03	Volume 3 - 335
High Energy Laser Development	0602890D8Z	24	02	Volume 3 - 79
High Energy Laser Research Initiatives	0601108D8Z	3	01	Volume 3 - 1
Historically Black Colleges and Universities and Minority-Serving Institutions	0601228D8Z	7	01	Volume 3 - 23
Homeland Defense Technology Transfer Program	0305387D8Z	245	07	Volume 3 - 1029
Humanitarian De-mining	0603920D8Z	93	04	Volume 3 - 439
Industrial Base Analysis and Sustainment Support	0607210D8Z	204	07	Volume 3 - 965
Information Systems Security Program	0303140D8Z	217	07	Volume 3 - 999
Intelligence Capabilities and Innovation Investments	0305245D8Z	193	06	Volume 3 - 959
Joint Capability Technology Demonstration (JCTD)	0603648D8Z	48	03	Volume 3 - 235
Joint DOD/DOE Munitions Technology Development	0603225D8Z	35	03	Volume 3 - 165
Joint Electromagnetic Technology (JET) Program	0303191D8Z	122	04	Volume 3 - 627
Joint Electronic Advanced Technology	0603618D8Z	47	03	Volume 3 - 227

Program Element Title	Program Element Number	Line #	BA	Page
Joint Hypersonic Technology Development & Transition	0603183D8Z	34	03	Volume 3 - 155
Joint Mission Environment Test Capability (JMETC)	0605100D8Z	155	06	Volume 3 - 837
Joint Munitions Advanced Technology	0603000D8Z	26	03	Volume 3 - 85
Joint Munitions Technology	0602000D8Z	9	02	Volume 3 - 29
Joint Systems Architecture Development	0604875D8Z	151	06	Volume 3 - 807
Joint Tactical Information Distribution System (JTIDS)	0604771D8Z	130	05	Volume 3 - 673
Joint Warfighting Program (JWP)	0603727D8Z	56	03	Volume 3 - 299
Lincoln Laboratory	0602234D8Z	13	02	Volume 3 - 45
Maintaining Technology Advantage	0605797D8Z	171	06	Volume 3 - 903
Missile Defeat Project	0604132D8Z	99	04	Volume 3 - 481
National Defense Education Program (NDEP)	0601120D8Z	6	01	Volume 3 - 15
National Security Innovation Network	0603950D8Z	67	03	Volume 3 - 371
Net Centricity	0305199D8Z	236	07	Volume 3 - 1015
Networked Communications Capability	0603662D8Z	49	03	Volume 3 - 255
Next Generation ICT (5G)	0604011D8Z	95	04	Volume 3 - 455
Nuclear Command, Control and Communications (NC3)	0605772D8Z	144	05	Volume 3 - 769
Nuclear Matters	0605161D8Z	161	06	Volume 3 - 873
Nuclear and Conventional Physical Security/National Technical Nuclear Forensics	0603161D8Z	74	04	Volume 3 - 389
Nuclear and Conventional Physical Security/National Technical Nuclear Forensics	0604161D8Z	127	05	Volume 3 - 633

Program Element Title	Program Element Number	Line #	BA	Page
ODNA Technology & Resource Analysis	0606225D8Z	179	06	Volume 3 - 943
OUSD(C) IT Development Initiative	0605027D8Z	135	05	Volume 3 - 705
Operational Energy Capability Improvement (OECI)	0604055D8Z	68	03	Volume 3 - 377
Operational Energy Prototyping (OEP)	0604555D8Z	108	04	Volume 3 - 613
Policy R&D Programs	0305186D8Z	235	07	Volume 3 - 1007
Prompt Global Strike Capability Development	0604165D8Z	128	05	Volume 3 - 653
Quick Reaction Special Projects (QRSP)	0603826D8Z	63	03	Volume 3 - 317
Rapid Prototyping Program	0604331D8Z	104	04	Volume 3 - 569
Retract Larch	0603527D8Z	46	03	Volume 3 - 225
SO/LIC Advanced Development	0603121D8Z	27	03	Volume 3 - 97
Science and Technology (S&T) Analytic Assessments	0603288D8Z	38	03	Volume 3 - 169
Small Business Innovation Research (SBIR)/Small Business Technology Transfer (STTR)	0605790D8Z	170	06	Volume 3 - 899
Small Business Innovation Research/Small Business Technology Transfer (SBIR/ STTR)	0605502D8Z	167	06	Volume 3 - 893
Software Engineering Institute (SEI)	0603781D8Z	62	03	Volume 3 - 311
Software Engineering Institute (SEI) Applied Research	0602751D8Z	23	02	Volume 3 - 73
Spectrum Access Research and Development	0303367D8Z	70	03	Volume 3 - 387
Strategic Environmental Research and Development Program (SERDP)	0603716D8Z	54	03	Volume 3 - 295
Studies and Analysis Support – OSD	0605151D8Z	160	06	Volume 3 - 869

Program Element Title	Program Element Number	Line #	BA	Page
Support to Networks and Information Integration (NII)	0605170D8Z	162	06	Volume 3 - 883
Systems Engineering	0605142D8Z	159	06	Volume 3 - 851
Technical Studies Support and Analysis	0605104D8Z	156	06	Volume 3 - 847
Technology Innovation	0603375D8Z	44	03	Volume 3 - 217
Test and Evaluation/Science and Technology	0603941D8Z	66	03	Volume 3 - 341
Trusted and Assured Microelectronics	0604294D8Z	103	04	Volume 3 - 517
Trusted and Assured Microelectronics	0605294D8Z	142	05	Volume 3 - 735
WALKOFF	0603600D8Z	75	04	Volume 3 - 419
Wargaming & Support for Strategic Analysis (SSA)	0604682D8Z	111	04	Volume 3 - 621

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 1: *Basic Research*	**R-1 Program Element (Number/Name)** PE 0601108D8Z / *High Energy Laser Research Initiatives*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	-	0.000	0.000	15.390	-	15.390	-	-	-	-	-	-
108: *Joint Directed Energy Basic Research*	-	0.000	0.000	15.390	-	15.390	-	-	-	-	-	-

Note

In FY 2022, High Energy Laser Research Initiatives (including funding) will be transferred from Air Force Program Element (PE) 0601108F to the Office of the Secretary of Defense (OSD) under PE 0601108D8Z for management and execution responsibility to better align this research area to Department of Defense Science and Technology strategy and priorities for Directed Energy. This Program will focus on fundamental science supporting future Directed Energy (DE) technologies divided into DE Sources, and Beam Control and Propagation. This is not a new start PE; efforts are follow-on from Air Force PE 0601108F.

A. Mission Description and Budget Item Justification

This program funds basic research aimed at developing fundamental scientific knowledge to support future Department of Defense Directed Energy weapon systems through the Joint Directed Energy Transition Office. This program funds multi-disciplinary research institutes to conduct research on laser, laser beam control and high power microwave technologies. In addition, this program supports educational grants to stimulate student interest in directed energy and encourage graduate research in topics related to high energy lasers and high power microwaves. These educational grants are used for educational tools, scholarships, and summer intern employees in military laboratories. Efforts in this program have been coordinated through the Department of Defense Science and Technology Executive Committee process to harmonize efforts and eliminate duplication.

This program is in Budget Activity 1, Basic Research because this budget activity includes scientific study and experimentation directed toward increasing fundamental knowledge and understanding in those fields of the physical, engineering, environmental, and life sciences related to long-term national security needs.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	0.000	0.000	-	0.000
Current President's Budget	0.000	0.000	15.390	-	15.390
Total Adjustments	0.000	0.000	15.390	-	15.390
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Program Adjustment	-	-	15.390	-	15.390

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 1: *Basic Research*	**R-1 Program Element (Number/Name)** PE 0601108D8Z / *High Energy Laser Research Initiatives*

Change Summary Explanation

In FY 2022, High Energy Laser Research Initiatives transferred from Air Force Program Element (PE) 0601108F to the Office of the Secretary of Defense (OSD) under PE 0601108D8Z for management and execution responsibility to better align this research area to OSD priorities.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 1	R-1 Program Element (Number/Name) PE 0601108D8Z / *High Energy Laser Research Initiatives*	Project (Number/Name) 108 / *Joint Directed Energy Basic Research*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
108: *Joint Directed Energy Basic Research*	-	0.000	0.000	15.390	-	15.390	-	-	-	-	-	-

Note

In FY 2022, High Energy Laser Research Initiatives (including funding) will be transferred from Air Force Program Element (PE) 0601108F to the Office of the Secretary of Defense (OSD) under PE 0601108D8Z for management and execution responsibility to better align this research area to OSD priorities. Additionally, this Program will focus on Directed Energy (DE) technologies divided into DE Sources, and Beam Control and Propagation to reflect the OSD Science and Technology (S&T) priorities for Directed Energy. This is not a new start PE; efforts are follow-on from Air Force PE 0601108F.

A. Mission Description and Budget Item Justification

This program funds basic research aimed at developing fundamental scientific knowledge to support future Department of Defense Directed Energy weapon systems through the Joint Directed Energy Transition Office. This program funds multi-disciplinary research institutes to conduct research on laser, laser beam control and high power microwave technologies. In addition, this program supports educational grants to stimulate student interest in directed energy and encourage graduate research in topics related to high energy lasers and high power microwaves. These educational grants are used for educational tools, scholarships, and summer intern employees in military laboratories. Efforts in this program have been coordinated through the Department of Defense Science and Technology Executive Committee process to harmonize efforts and eliminate duplication.

This program is in Budget Activity 1, Basic Research because this budget activity includes scientific study and experimentation directed toward increasing fundamental knowledge and understanding in those fields of the physical, engineering, environmental, and life sciences related to long-term national security needs.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Directed Energy Sources	-	-	7.740
Description: Improve the fundamental understanding and modeling of high energy laser and high power microwave sources and devices.			
FY 2022 Plans: Investigate innovative laser technologies, in diode-pumped lasers, fiber, and solid state laser technologies. Monitor overseas efforts to leverage international technology advancements. Investigate innovative high power laser technologies.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 1	**R-1 Program Element (Number/Name)** PE 0601108D8Z / *High Energy Laser Research Initiatives*	**Project (Number/Name)** 108 / *Joint Directed Energy Basic Research*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Investigate innovative microwave technologies, in microwave sources, antennas, and related microwave component technologies. Continue overseas efforts to leverage international microwave technology advancements. Investigate innovative high power microwave technologies. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** In FY 2022, Program Element and funding transferred from Air Force Program Element (PE) 0601108F to the Office of the Secretary of Defense (OSD).			
Title: Beam Control and Propagation ***Description:*** Improve the fundamental understanding and modeling of beam control technologies as they relate to high energy laser applications and high power microwaves. Conduct research in atmospheric characterization, metrology, control systems, algorithms, waveguides, antennas and beam control component technology. ***FY 2022 Plans:*** Conduct research of innovative high energy laser beam control architectures. Leverage international research developments and technology advancements where possible. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** In FY 2022, Program Element and funding transferred from Air Force Program Element (PE) 0601108F to the Office of the Secretary of Defense (OSD).	-	-	7.650
Accomplishments/Planned Programs Subtotals	-	-	15.390

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

NA

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 1: *Basic Research*	**R-1 Program Element (Number/Name)** PE 0601110D8Z / *Basic Research Initiatives*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	-	68.534	75.542	39.828	-	39.828	-	-	-	-	-	-
010: *Basic Research Initiatives*	-	34.237	43.966	3.980	-	3.980	-	-	-	-	-	-
060: *Vannevar Bush Faculty Fellowship*	-	34.297	31.576	31.848	-	31.848	-	-	-	-	-	-
016: *Minerva Research Initiative*	-	0.000	0.000	4.000	-	4.000	-	-	-	-	-	-

Note

In FY 2022, New Project Code added for the Minerva Research Initiative. This effort is being re-aligned from Project Code 010 to new Project Code 016.

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 (VBFF) Program.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	70.874	35.565	36.382	-	36.382
Current President's Budget	68.534	75.542	39.828	-	39.828
Total Adjustments	-2.340	39.977	3.446	-	3.446
• Congressional General Reductions	-	-0.023			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	40.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-2.340	-			
• Program Adjustment	-	-	3.446	-	3.446

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 1: *Basic Research*	**R-1 Program Element (Number/Name)** PE 0601110D8Z / *Basic Research Initiatives*

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2020	FY 2021
Project: 010: *Basic Research Initiatives*		
Congressional Add: *Program Increase for Minerva Research Initiative*	2.000	17.000
Congressional Add: *Defense Experimental Program to Stimulate Competitive Research (DEPSCoR)*	9.660	17.000
Congressional Add: *Cyber Research*	8.000	-
Congressional Add: *National Consortium for the Study of Terrorism and Responses to Terrorism (START)*	-	5.000
Congressional Add: *National Academy of Science (NAS) Study on Confucius Centers*	-	1.000
Congressional Add Subtotals for Project: 010	19.660	40.000
Congressional Add Totals for all Projects	19.660	40.000

Change Summary Explanation

FY 2022 increase for Minerva.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 1	R-1 Program Element (Number/Name) PE 0601110D8Z / *Basic Research Initiatives*	Project (Number/Name) 010 / *Basic Research Initiatives*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
010: *Basic Research Initiatives*	-	34.237	43.966	3.980	-	3.980	-	-	-	-	-	-

Note

In FY 2022, New Project Code added for the Minerva Research Initiative. This effort is being re-aligned from Project Code 010 to new Project Code 016.

A. Mission Description and Budget Item Justification

The Basic Research Initiatives project, Project Code 010, 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 produce high-payoff, transformative scientific breakthroughs for the Department, which can open new approaches of technology dominance and mastery of new domains of warfare. SSBR initiatives support the five Basic Research Office strategic goals: (1) support the modernization priorities set by the Office of the Secretary of Defense (OSD); (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 (ONR) and the Air Force Office of Scientific Research (AFOSR), seeks to build a fundamental understanding of the sources of present and future conflict.

FY 2020 was the last year of funding for the Minerva Research Initiative in this Project Code. In FY 2021, received a $17 million congressional add in support of Minerva efforts. Starting in FY 2022, Minerva efforts will be funded under separate Project Code 016.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Strategic Support for Basic Research (SSBR)	3.163	3.966	3.980
Description: SSBR supports oversight, policies, and initiatives to create conditions that allow defense basic research investments to produce high-payoff, transformative scientific breakthroughs for the Department, which can open new approaches of technology dominance and mastery of new domains of warfare. SSBR initiatives support the five Basic Research Office strategic goals: (1) support the modernization priorities set by the Office of the Secretary of Defense (OSD); (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. ***FY 2021 Plans:*** 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 year of the Dean's Roundtable. Review outcomes of the Bush Fellows Research Study Team (BFRST) pilot program and develop			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 1	**R-1 Program Element (Number/Name)** PE 0601110D8Z / *Basic Research Initiatives*	**Project (Number/Name)** 010 / *Basic Research Initiatives*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
strategy and roadmap to enhance the interchange between Academia and the DoD to rapidly devise new solutions to warfighter challenges. 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 Under Secretary of Defense for Research and Engineering (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 Science, Technology, and Innovation Exchange (STIx) conference to increase awareness of DoD basic research programs. ***FY 2022 Plans:*** Plans for FY 2022 are similar in type and scope to those of FY 2021. The BFRST program will award a new class of fellows, selected from active VBFF fellows, according to the critical priorities of the DoD. The impact of current programs on nation-wide engineering and manufacturing capabilities of the future will be assessed. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Changes reflect minor budget fluctuations.			
Title: Minerva Research Initiative (MRI) ***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 the 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.	11.414	-	-
Accomplishments/Planned Programs Subtotals	14.577	3.966	3.980

	FY 2020	FY 2021
Congressional Add: Program Increase for Minerva Research Initiative	2.000	17.000
FY 2020 Accomplishments: The Minerva Research Initiatives made two awards on the Foreign Malign Influence interest of the FY 2020 program increase. The total of both awards, $3.900 million, included		

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 1	**R-1 Program Element (Number/Name)** PE 0601110D8Z / *Basic Research Initiatives*	**Project (Number/Name)** 010 / *Basic Research Initiatives*

	FY 2020	FY 2021
supplemental funding from the Air Force Office of Scientific Research (AFOSR). These 3-year awards are scheduled to conclude in FY 2023. ***FY 2021 Plans:*** In addition to FY 2021 funds supporting ongoing awards, Minerva will use FY 2021 funds to make awards out of a forthcoming Funding Opportunity Announcement (FOA) competition, expanding the Defense Education and Civilian University Research (DECUR) Partnership, and continuing to support the Minerva-USIP advanced graduate students, developing future researchers working on DoD problems.		
Congressional Add: Defense Experimental Program to Stimulate Competitive Research (DEPSCoR) ***FY 2020 Accomplishments:*** DEPSCoR continued to build on the program started in FY 2019 to expand the DoD research landscape in states that have traditionally not received large quantities of DoD funds, enhancing the capabilities of institutions of higher education and increasing the number of university researchers responsive to DoD needs. The program included augmenting Service capacity building projects by supporting four additional Defense University Research Initiative Program awards, outreach to research institutions that have less engagement with the DoD by conducting a DEPSCOR webinar, and a stand-alone DEPSCoR competition which will provide support for at least 15 new basic research grants. ***FY 2021 Plans:*** DEPSCoR will continue to build on the program started in FY 2019 to expand the DoD research landscape in states that have traditionally not received large quantities of DoD funds, enhancing the capabilities of institutions of higher education and increasing the number of researchers responsive to DoD needs. The program will include a stand-alone DEPSCoR competition which will provide support for at least 20 new basic research grants, outreach to research institutions that have less engagement with the DoD by conducting a virtual DEPSCoR-day and upto two outreach events around the country, and supporting university capacity building activities in DoD relevant fields.	9.660	17.000
Congressional Add: Cyber Research ***FY 2020 Accomplishments:*** A multi-disciplinary research program was initiated to detect and mitigate the transmission of information designed to influence, deceive, and propagandize audiences in digital and social media. The first part of the program aims to develop methods to characterize influence campaigns and agents, and develop operationally effective recommendations for countering and blunting malicious campaigns. The second part of the program is a basic research effort in rigorous mathematical approaches, merged with socio-psychological models and implemented on modern computer science concepts, towards the development and automation of real-time detection and prediction of foreign malign influence operations, and the deployment of immediate counter-measures. This basic research will lay the groundwork for the field of socio-mathematics, enhanced by artificial intelligence, for combating malicious influence.	8.000	-
Congressional Add: National Consortium for the Study of Terrorism and Responses to Terrorism (START)	-	5.000

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 1	**R-1 Program Element (Number/Name)** PE 0601110D8Z / *Basic Research Initiatives*	**Project (Number/Name)** 010 / *Basic Research Initiatives*

	FY 2020	FY 2021
FY 2021 Plans: As guided by conversations with Congressional authorizers and appropriators, the National Consortium for the Study of Terrorism and Responses to Terrorism (START) funds will be used to support maintenance and ongoing work on START-maintained datasets, including the Global Terrorism Database. Remaining funds will support 6.1 research on Irregular Warfare problem sets, as informed through conversations with the needs of the Joint Special Operations University and the Special Operations Forces (SOF) community.		
Congressional Add: National Academy of Science (NAS) Study on Confucius Centers	-	1.000
FY 2021 Plans: The Defense Authorization Act for Fiscal Year 2021 contained a requirement that the Department cease funding (by October 1, 2023) institutions of higher education (for purposes other than direct support to students for education) that are host to Confucius Institutes. The congressional add will be used to provide funding to the National Academies of Sciences, Engineering, and Medicine (NASEM) to study the impacts of Confucius Institutes on the defense-funded academic research enterprise and to fulfill the Congressional requirement to consult with NASEM before deciding on whether to provide waivers for academic institutions hosting Confucius Institutes beyond October 1, 2023. The Basic Research Office is working with other stakeholders within OUSD(R&E) to develop an effective study plan. Once complete, the Basic Research Office will work with NASEM to execute the study and inform Department actions well in advance of the October 1, 2023 deadline. This study may also serve as awareness building within the academic community about the issues surrounding Confucius Institutes.		
Congressional Adds Subtotals	19.660	40.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 1	R-1 Program Element (Number/Name) PE 0601110D8Z / *Basic Research Initiatives*	Project (Number/Name) 060 / *Vannevar Bush Faculty Fellowship*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
060: *Vannevar Bush Faculty Fellowship*	-	34.297	31.576	31.848	-	31.848	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

The Vannevar Bush Faculty Fellowship (VBFF) program supports world-class researchers in scientific areas of critical importance to the 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 and human-machine interfaces, Engineering Biology, Applied and Computational Mathematics, Networks, Machine Learning and Artificial Intelligence, Manufacturing Science, and others. The program delivers the most innovative and transformational scientific ideas of relevance to the DoD, from the top scientists in the Nation. The program fosters close connections between academia and the defense science and engineering (S&E) enterprise, a primary goal of Strategic Support for Basic Research (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.

The project includes support for the Laboratory-University Collaboration Initiative (LUCI) program, which is designed to team scientists in the DoD laboratories with top academic researchers from the programs sponsored or overseen by the Office of the Secretary of Defense (in particular, the VBFF fellows mentioned above), in order to collaboratively perform basic research on a topic of their choice. The three-year grants allow a deep exchange of ideas between academic and the DoD research communities, brings the most recent scientific breakthroughs closer to DoD relevance, and greatly expands the skills and knowledge of the S&E workforce within the laboratories.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Vannevar Bush Faculty Fellowship (VBFF) Program	34.297	31.576	31.848
Description: The VBFF Program ensures the DoD has a research portfolio that supports highly creative, innovative, and productive university researchers. The objectives of the program are to: (1) support scientific research that may lead to extraordinary outcomes of relevance to the DoD; (2) educate and train students 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 contributing to the DoD's mission.			
FY 2021 Plans: Support 57 Vannevar Bush Fellows and collaborative research efforts with 27 LUCI Fellows from DoD Service Laboratories. Review and update program focus topic areas with input from the 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			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 1	**R-1 Program Element (Number/Name)** PE 0601110D8Z / *Basic Research Initiatives*	**Project (Number/Name)** 060 / *Vannevar Bush Faculty Fellowship*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
and execute a competition for the LUCI program. Conduct review of LUCI projects in DoD laboratories and report the scientific progress and impacts. ***FY 2022 Plans:*** Plans for FY 2022 are similar in type and scope to those of FY 2021. The VBFF and LUCI class sizes will gradually increase, pending sufficient quality of proposals. Program reviews will be held. The scientific topics of interest will be re-examined and the Funding Opportunity Announcement (FOA) updated accordingly. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The increase from FY 2021 to FY 2022 will support the increase in class size for VBFF and LUCI programs.			
Accomplishments/Planned Programs Subtotals	34.297	31.576	31.848

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 1	R-1 Program Element (Number/Name) PE 0601110D8Z / *Basic Research Initiatives*	Project (Number/Name) 016 / *Minerva Research Initiative*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
016: *Minerva Research Initiative*	-	0.000	0.000	4.000	-	4.000	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

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 the 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.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Minerva Research Initiative (MRI)	-	-	4.000
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 the 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. ***FY 2022 Plans:*** With the FY22 base budget, Minerva will support research on the social, cultural, behavioral, economic, and political impacts of climate and environmental change. This includes university grants and projects partnering with Professional Military Education Institutions. Furthermore, the program will continue collaborating with the operational community on all issues for which it has developed expertise among the social science community; it will help implement the DoD plan for social, management, and information sciences as guided in the 2021 NDAA sec. 220 language; and it will continue collaboration with the U.S. Institute of Peace in supporting advanced doctoral students pursuing research on DoD topics of interest. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** In FY 2022, the MRI effort was re-aligned from Project Code 010 to this new Project Code 016.			
Accomplishments/Planned Programs Subtotals	-	-	4.000

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 1	**R-1 Program Element (Number/Name)** PE 0601110D8Z / *Basic Research Initiatives*	**Project (Number/Name)** 016 / *Minerva Research Initiative*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 1: *Basic Research*	**R-1 Program Element (Number/Name)** PE 0601120D8Z / *National Defense Education Program (NDEP)*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	-	139.002	137.154	112.195	-	112.195	-	-	-	-	-	-
120: *National Defense Education Program (NDEP)*	-	139.002	137.154	112.195	-	112.195	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

The National Defense Education Program (NDEP) fosters and enhances the Department of Defense's (DoD) ability to develop and 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 (OUSD(R&E)). Aligned to the Federal STEM Strategy, NDEP addresses critical STEM education and talent development challenges using a continuous learning structure and evidence-based approaches. Specifically, NDEP is part of the broader Department-wide effort under DoD STEM, which works collectively with partners from academia, industry, not-for-profit organizations, defense laboratories and other government entities to: (1) build strong foundations for STEM literacy; (2) increase diversity, equity, and inclusion in STEM; and (3) prepare the STEM workforce of the future. NDEP components engage in assessment and evaluation practices as outlined by the Office of Management and Budget and the Government Accountability Office.

NDEP's portfolio includes: the Science, Mathematics, and Research for Transformation (SMART) program; STEM Education and Outreach; and the Manufacturing Engineering Education Program (MEEP). NDEP activities align with the Department's vision of a diverse STEM talent pool readily accessible to serve our Nation and evolve the Department's competitive edge. NDEP aligns to the DoD STEM Strategy in support of the National Defense Strategy and the DoD science and technology (S&T) modernization priorities.

NDEP activities supports the DoD STEM effort in providing authentic learning experiences through a variety of education and outreach initiatives in the form of scholarships, internships, enrichment activities, competitions, and mentorships, by leveraging partners from industry, academia, and other government organizations with a shared STEM mission. The DoD STEM programs span across all age groups, including kindergarten through 12th grade (K-12) students and teachers; postsecondary, undergraduate and graduate students.

The SMART program awards highly competitive scholarships-for-service to undergraduate and graduate students in 22 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 3,044 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.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 1: *Basic Research*	**R-1 Program Element (Number/Name)** PE 0601120D8Z / *National Defense Education Program (NDEP)*

NDEP will continue to support the preparation of dependents of members of the armed forces for careers in STEM as enacted under 10 USC 2192(b) in FY20. STEM education and outreach activities as well as MEEP efforts will continue to engage military connected students in collaboration with the Department of Defense Education Activity (DoDEA). Additionally, where feasible, NDEP activities will also support the Supporting Veterans in STEM Careers Act, enacted in FY20.

STEM Education and Outreach is a multitude of cohesive and coordinated activities for K-16 students, teachers, and schools, especially those for underrepresented and underserved communities, to include military connected students. In March 2019, the Defense STEM Education Consortium (DSEC) was established to facilitate these efforts. DSEC is a consortium model approach that leverages a collaborative ecosystem/partnership between academia, industry, not-for-profit organizations, and government that aims to broaden STEM literacy and develop a diverse and agile workforce to power the United States' innovative defense infrastructure. DSEC is a 5-year, $75M investment, which comprises a diverse consortium of program partners and is designed to leverage evidence-based approaches to inspire and develop the U.S. science and technology future workforce. Finally, DSEC is designed to evolve over time and has built-in Innovation Bloc (IB) funding which allows the consortium to address emerging issues in STEM education and potential gaps within the portfolio.

The DoD consistently seeks innovative scientific and technological solutions to address current and future military requirements. The MEEP will enhance existing, or establish new education programs (or collection of programs, to better position the current and next generation manufacturing workforce to produce military systems and components that assure technological superiority for the Department. The BIOTECH Education Program will establish new educational programs that align with BIOTECH Modernization priorities.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	144.074	100.241	106.285	-	106.285
Current President's Budget	139.002	137.154	112.195	-	112.195
Total Adjustments	-5.072	36.913	5.910	-	5.910
• Congressional General Reductions	-	-0.087			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	37.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-5.072	-			
• Program Adjustments	-	-	5.910	-	5.910

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2020	FY 2021
Project: 120: *National Defense Education Program (NDEP)*		
Congressional Add: *Regional Fabrication and Certification Training Labs*	15.000	-
Congressional Add: *Basic Research / STEM Education Program Increase*	35.000	35.000
Congressional Add: *Civics Education*	2.000	2.000

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 1: *Basic Research*	**R-1 Program Element (Number/Name)** PE 0601120D8Z / *National Defense Education Program (NDEP)*

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2020	FY 2021
Congressional Add Subtotals for Project: 120	52.000	37.000
Congressional Add Totals for all Projects	52.000	37.000

Change Summary Explanation

FY 2022 increase for Science and Technology Scholarships.

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Workforce Development - Science, Mathematics, and Research for Transformation (SMART) Defense Education Program	65.932	77.013	88.843

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; Computer Engineering; 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.

Since FY 2006, the SMART program has awarded 3,367 scholarships to scholars engaging with 206 sponsoring facilities across the Department of Defense. In part, SMART's success is measured by participants that choose to remain in the DoD workforce beyond their required service commitment. Approximately 91% of the participants have successfully completed their service agreement. To date, these scholars have transitioned as civilian employees into the Air Force, Army, Navy, and other DoD components.

Oversight of the SMART program falls under the Office of the Under Secretary of Defense for Research and Engineering (USD(R&E)) with execution at the Component level. 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 enterprise through research and work experiences in defense laboratories, thereby enhancing their educational experience and understanding the relevance of DoD research priority areas.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 1: *Basic Research*	**R-1 Program Element (Number/Name)** PE 0601120D8Z / *National Defense Education Program (NDEP)*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
FY 2021 Plans: • Strengthen mentorship opportunities at the sponsoring facilities/laboratories to better acclimate scholars to DoD civilian service and prepare them to excel in their chosen career paths. • 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. • 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. • Continue to strengthen partnerships with HBCU/MIs to increase diversity and awareness of research and STEM initiatives that meet DoD Component and Laboratory mission needs. • Conduct a SMART Symposium and re-energize the SMART Ambassador program and SMART Scholars Steering Committee (SSSC) to continually enhance inter-Service collaboration and provide scholars a networking forum. ***FY 2022 Plans:*** • Continue to ensure SMART awards meet the technical needs of the Department's STEM workforce and sustain the scientific and technological superiority on the battlefield. • Continue to strengthen partnerships with HBCU/MIs to increase diversity and awareness of research and STEM initiatives that meet DoD Component and Laboratory mission needs. • Conduct a SMART Symposium and grow the SMART Ambassador program and SMART Scholars Steering Committee (SSSC) to continually enhance inter-Service collaboration and provide scholars a networking forum. • Continue SMART SEED initiative to provide an opportunity to competitively award research grants to scholars who have pursued a PhD through the SMART Program and are currently in the service commitment phase of their scholarship. As future science and technology leaders within the DoD, SEED grants provide opportunities for early-career researchers to establish and lead their own basic and applied research under the mentorship of a more senior subject matter expert, while also providing networking opportunities to other related activities across the DoD. This effort aims to enhance scholar experience during their service commitment, and prepares awardees for long term success as more seasoned technical experts within the DoD workforce. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Additional funding will allow the program to increase the number of scholarships to be awarded in FY 2022 to help meet the DoD's workforce needs. The program typically awards approximately 250-300 scholarships annually. This funding increase will award approximately 350-400 scholarships in FY 2022.			
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 (MCCP))	11.483	-	-

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 1: *Basic Research*	**R-1 Program Element (Number/Name)** PE 0601120D8Z / *National Defense Education Program (NDEP)*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
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 in 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. The original Military Child Pilot Program Authority expired at the end of FY 2020. However, NDEP and the broader DoD STEM efforts will continue to support the preparation of military connected students in STEM careers. Beginning in FY21, MCPP efforts will be integrated into the broader DoD STEM efforts.			
Title: Science, Technology, Engineering, and Mathematics (STEM) Education and Outreach	9.587	21.141	21.352
Description: NDEP's STEM Education and Outreach activities provides students and teachers across the K-16 continuum unique experiences aimed to support and cultivate STEM talent with minds for innovation, diversity of thought, and the technical agility to sustain the Department's competitive edge into the future. In order to build a workforce that solves national defense needs and challenges, the DoD recognizes the necessity 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 learning experiences for students and teachers across the globe. STEM Education and Outreach activities are aligned to the Department's STEM Strategic Plan support the Federal STEM Education Strategic Plan, and enable the Department to have enduring access to STEM talent, now and into the future. ***FY 2021 Plans:*** • 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. • Will continue to participate in inter- and intra-departmental collaboration with stakeholders to achieve Federal and DoD STEM objectives. • Expand the experience of DoD supported STEM education and outreach opportunities to reach all populations, through consideration of the barriers faced by underserved and underrepresented populations. • Will finalize the Department's new STEM Strategic Plan. • Will fully integrate Military Child Program into all STEM Education and Outreach efforts. ***FY 2022 Plans:*** • 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 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 1: *Basic Research*	**R-1 Program Element (Number/Name)** PE 0601120D8Z / *National Defense Education Program (NDEP)*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
• Continue to leverage DSEC Consortium partnerships, STEM ecosystems, and other government partnerships to amplify awareness and broaden reach • Continue to participate in inter- and intra-departmental collaboration with stakeholders to achieve Federal and DoD STEM objectives. • Continue to expand the experience of DoD supported STEM education and outreach opportunities to reach all populations, through consideration of the barriers faced by underserved and underrepresented populations. • Coordinate with DoD Components to develop an Implementation Plan in support of Strategic Plan. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Changes reflect minor budget fluctuations.			
Title: Biotechnology (BIOTECH) Education Program ***Description:*** In order to build a BIOTECH workforce that solves national defense needs and challenges, the DoD recognizes the importance of supporting domestic programs that motivate young people to pursue education and career opportunities in biotechnology. ***FY 2021 Plans:*** • Support DoD and Federal STEM Education Strategy and the Department's BIOTECH Roadmap in building biotechnology literacy, diversity and inclusion, and developing the future biotech workforce. • Communicate DoD's support for U.S. BIOTECH workforce development, which includes increasing U.S. participation in iGEM (International Genetically Engineered Machine) 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. ***FY 2022 Plans:*** Support DoD and Federal STEM Education Strategy and Department's BIOTECH Roadmap in building biotechnology literacy, diversity and inclusion, and developing the future biotech workforce.	-	2.000	2.000
Accomplishments/Planned Programs Subtotals	87.002	100.154	112.195

	FY 2020	FY 2021
Congressional Add: Regional Fabrication and Certification Training Labs	15.000	-
FY 2020 Accomplishments: • Funding was sent to AFRL to support their programs in this area, which will: • Develop and implement a concept of operations for regional training development and curation featuring (but not limited to) community colleges and career technical centers.		

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 1: *Basic Research*	**R-1 Program Element (Number/Name)** PE 0601120D8Z / *National Defense Education Program (NDEP)*

	FY 2020	FY 2021
• Develop a Training, Curriculum, and Certification Program which accommodates a variety of future manufacturing skill needs and which is based on input from manufacturers, academia, content developers and subject matter experts. • Develop a credentialing strategy which would be recognized and validated by Industry. • Develop an Industry 4.0 Career Pathways Model which ensures that programs are aligned with industry demand and offer predictable transitions for students.		
Congressional Add: Basic Research / STEM Education Program Increase	35.000	35.000
FY 2020 Accomplishments: • Published a request for information (RFI) on grants.gov. Reviewed and analyzed responses to questions on (1) STEM education, outreach, and workforce development; (2) biotechnology education and workforce development; and, (3) enhanced civics education. • Hosted a webinar based on the RFI, which discussed additional topics such as:(1) COVID-19 impacts to STEM education; (2) best practices in formal/informal STEM education especially in reaching underserved/ underrepresented populations, to include military connected students; (3) biotechnology education and workforce development; and (4) addressed educational goals and pathways under the Federal STEM Education Strategic Plan. Over 400 individuals registered from across the Components, federal agencies, academia, non-profit, and industry. • Conducted analysis on the information captured from the webinar and from the RFI to inform requirements on funding opportunity announcement (FOA). • Published an FOA on 10 December 2020, seeking grant proposals for opportunities that expand on existing STEM education, outreach and workforce development programs ***FY 2021 Plans:*** Seek further opportunities to expand STEM education, outreach and workforce development programs that support the DoD and Federal STEM Education Strategic Plans through a funding opportunity announcement (FOA).		
Congressional Add: Civics Education	2.000	2.000
FY 2020 Accomplishments: • Published a request for information (RFI) on grants.gov. Reviewed and analyzed responses to questions on (1) STEM education, outreach, and workforce development; (2) biotechnology education and workforce development; and, (3) enhanced civics education. • Hosted a webinar based on the RFI, which discussed additional topics such as: (1) COVID-19 impacts to STEM education; (2) best practices in formal/informal STEM education especially in reaching underserved/ underrepresented populations, to include military connected students; (3) biotechnology education and workforce development; and (4) addressed educational goals and pathways under the Federal STEM Education		

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 1: *Basic Research*	**R-1 Program Element (Number/Name)** PE 0601120D8Z / *National Defense Education Program (NDEP)*

	FY 2020	FY 2021
Strategic Plan. Over 400 individuals registered from across the Components, federal agencies, academia, non-profit, and industry. • Conducted analysis on the information captured from the webinar and from the RFI to inform requirements on funding opportunity announcement (FOA). • Published an FOA on 10 December 2020, seeking grant proposals for opportunities that enhance civics education through: the development or modification of curricula relating to civics education; classroom activities, thesis projects, individual or team projects, internships, or community service activities relating to civics; collaboration with government entities, nonprofit organizations, or consortia of such entities and organizations to provide participants with civics-related experiences;and civics-related faculty development programs. ***FY 2021 Plans:*** Seek further opportunities to expand STEM education, outreach and workforce development programs that support the DoD and Federal STEM Education Strategic Plans through a funding opportunity announcement (FOA).		
Congressional Adds Subtotals	52.000	37.000

D. Other Program Funding Summary ($ in Millions)

N/A

Remarks

E. Acquisition Strategy

N/A

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 1: *Basic Research*	**R-1 Program Element (Number/Name)** PE 0601228D8Z *I Historically Black Colleges and Universities and Minority-Serving Institutions*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	-	50.775	81.280	31.136	-	31.136	-	-	-	-	-	-
448: *Historically Black Colleges and Universities and Minority-Serving Institutions*	-	50.775	81.280	31.136	-	31.136	-	-	-	-	-	-

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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	52.708	30.975	31.637	-	31.637
Current President's Budget	50.775	81.280	31.136	-	31.136
Total Adjustments	-1.933	50.305	-0.501	-	-0.501
• Congressional General Reductions	-	-0.020			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	50.325			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-1.933	-			
• Program Adjustment	-	-	-0.501	-	-0.501

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 1: *Basic Research*	**R-1 Program Element (Number/Name)** PE 0601228D8Z *I Historically Black Colleges and Universities and Minority-Serving Institutions*

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2020	FY 2021
Project: 448: *Historically Black Colleges and Universities and Minority-Serving Institutions*		
Congressional Add: *HBCU/MI Program Increase*	22.000	46.325
Congressional Add: *Minority STEM Recruitment and Research*	-	4.000
Congressional Add Subtotals for Project: 448	22.000	50.325
Congressional Add Totals for all Projects	22.000	50.325

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 1	R-1 Program Element (Number/Name) PE 0601228D8Z / *Historically Black Colleges and Universities and Minority-Serving Institutions*	Project (Number/Name) 448 / *Historically Black Colleges and Universities and Minority-Serving Institutions*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
448: *Historically Black Colleges and Universities and Minority-Serving Institutions*	-	50.775	81.280	31.136	-	31.136	-	-	-	-	-	-

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 2020	FY 2021	FY 2022
Title: Historically Black Colleges and Universities and Minority-Serving Institutions (HBCU/MI)	28.775	30.955	31.136
Description: The HBCU/MI program provides support for research and collaboration with DoD facilities and personnel. The research grants further knowledge in the basic scientific and engineering disciplines through theoretical and empirical activities. Collaborative research allows university professors to work directly with DoD laboratories or other universities.			
FY 2021 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 1	**R-1 Program Element (Number/Name)** PE 0601228D8Z / *Historically Black Colleges and Universities and Minority-Serving Institutions*	**Project (Number/Name)** 448 / *Historically Black Colleges and Universities and Minority-Serving Institutions*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
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. Continue the summer interns and faculty fellows program. Continue Centers of Excellence in support of the Under Secretary of Defense for Research and Engineering (USD(R&E)) priorities in the areas of Cyber Security, Research Data Analytics, Autonomy, Artificial Intelligence/Machine Learning, Quantum Science, and Fully-Networked Command, Control, and Communication. Continue STEM Centers of Excellence at the 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 USD(R&E) priorities in the areas of Biotechnology, Materials Science, and Aerospace Research and Education. Conduct outreach activities, to include one webinar and two technical assistance workshops to expose HBCUs/MIs to opportunities in DoD. Maintain collaboration with the National Academies of Science, Engineering, and Medicine for the Minority-Serving Institutions Town Hall Series to examine strategies to expand STEM education and research activities at HBCU/MIs. ***FY 2022 Plans:*** Continue efforts from FY 2021. 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. Continue the summer interns and faculty fellows program. Continue Centers of Excellence in support of the USD(R&E) priorities and the National Defense Strategy in the areas needed to expand STEM opportunities for underrepresented minorities. Conduct annual review of the Centers. Conduct outreach activities, to include one webinar and two technical assistance workshops to expose HBCUs/MIs to opportunities in the DoD. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Changes reflect minor budget fluctuations.			
Accomplishments/Planned Programs Subtotals	28.775	30.955	31.136

	FY 2020	FY 2021
Congressional Add: HBCU/MI Program Increase	22.000	46.325
FY 2020 Accomplishments: The FY 2020 congressional increase of $22.000 million supported HBCU/MI program expansion to develop three new Centers of Excellence. The first Center is an Aerospace Research and Education Innovation Center as directed by Congress ($2.000 million congressional add). Additional program increase funding was used to establish two new Centers to address USD(R&E) priority areas to include Materials Science and Biotechnology. Program funding was also used to conduct increased outreach activities, additional student opportunities, and to conduct the mandated National Academies of Science, Engineering, and Medicine study on defense research conducted at HBCUs/MIs.		

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 1	**R-1 Program Element (Number/Name)** PE 0601228D8Z / *Historically Black Colleges and Universities and Minority-Serving Institutions*	**Project (Number/Name)** 448 / *Historically Black Colleges and Universities and Minority-Serving Institutions*

	FY 2020	FY 2021
Awarded 40 single-investigator basic research grants for a total of $25.486 million based on the FY 2020 HBCU/MI Research and Education Program funding opportunity announcement. Virtually placed 108 summer interns and 19 faculty fellows at 13 different defense laboratories and DoD organizations including the OSD Cost Assessment and Program Evaluation for 10-weeks. Conducted reviews of the FY 2015 awarded Centers of Excellence (COEs) in Autonomy, Cyber Security, and Big Data Analytics. Collectively, the COEs have supported 274 students and graduated 170 STEM scholars. Centers have leveraged their research capacity to secure a combined $26.700 million in additional funding for sustainment. Conducted six National Academies of Science, Engineering, and Medicine Minority-Serving Institutions Town Halls to examine strategies to expand HBCU/MI STEM education and research activities. ***FY 2021 Plans:*** Expand annual competition of the HBCU/MI program for equipment/instrumentation grants. Continue Centers of Excellence in support of the Under Secretary of Defense for Research and Engineering (USD(R&E)) priorities in the areas of Artificial Intelligence/Machine Learning (AI/ML), Quantum Science, and Fully-Networked Command, Control, and Communication. Continue STEM Centers of Excellence at the Center for STEM Scholars, and the Center for Minority Women in STEM, needed to expand STEM opportunities for underrepresented minorities. Continue Aerospace Education Research and Innovation Center to support undergraduate research in materials and aerospace sciences relevant to DOD and to expand the future aerospace technical workforce, particularly for underrepresented populations. Conduct annual review of the Centers. Expand the HBCU/MI Program to develop new Centers of Excellence to address USD(R&E) priorities in the areas of Biotechnology and Materials Science. Conduct outreach activities, to include one webinar and one technical assistance workshop to expose HBCUs/MIs to opportunities in DoD. Maintain collaboration with the National Academies of Science, Engineering, and Medicine (NASEM) for the Minority-Serving Institutions Town Hall Series to examine strategies to expand STEM education and research activities at HBCU/MIs. Continue partnership with NASEM in support of the FY 2020 NDAA Section 262, National Study on Defense Research at HBCUs and other MIs. Monitor the University Affiliated Research Center HBCU Pilot Program supporting three regional HBCUs with research projects involving 5G, AI/ML, Cyber, and a ChatBot testbed to elevate the research profile and exposure to higher levels of defense research.		
Congressional Add: Minority STEM Recruitment and Research	-	4.000

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 1	**R-1 Program Element (Number/Name)** PE 0601228D8Z / *Historically Black Colleges and Universities and Minority-Serving Institutions*	**Project (Number/Name)** 448 / *Historically Black Colleges and Universities and Minority-Serving Institutions*

	FY 2020	FY 2021
FY 2021 Plans: Conduct minority STEM recruitment in partnership with the Science, Mathematics & Research for Transformation (SMART) Scholarship for Service Program as encouraged by Section 250 in the FY 2021 NDAA. Support HBCU/MI Pilot Program with the SMART Scholarship Program to develop and train the next generation of STEM leaders. Encourage HBCU/MI students to apply for SMART scholarships through targeted outreach including joint webinars focused on fostering a community of diversity and the STEM workforce. Collaborate with the Air Force Research Laboratory Minority Leaders Program to enhance STEM training for underrepresented populations in support of national security needs and the defense mission. We will host a brainstorming meeting with stakeholders in the community to identify any new programming needed to round out the portfolio.		
Congressional Adds Subtotals	22.000	50.325

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 2: *Applied Research*	**R-1 Program Element (Number/Name)** PE 0602000D8Z / *Joint Munitions Technology*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	-	19.092	24.397	19.591	-	19.591	-	-	-	-	-	-
000: *Insensitive Munitions*	-	12.924	0.000	0.000	-	0.000	-	-	-	-	-	-
204: *Enabling Fuze Technology*	-	6.168	6.288	0.000	-	0.000	-	-	-	-	-	-
076: *Enhanced Munitions*	-	0.000	18.109	19.591	-	19.591	-	-	-	-	-	-

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. In FY 2022 the JFTP and JEMTP will merge and the program scope will expand to exploit technology developments and accelerate their application to enable next generation kinetic weapons capabilities in the areas of energetic materials, propulsion, warhead effects, fuzing, power sources, guidance, navigation & control, communications and munitions airframe applied technologies.

With the JFTP and JEMTP merge in FY 2022, the P204: Enabling Fuze Technology line and budget will combine into P076 Enhanced Munitions.

A. Mission Description and Budget Item Justification

This program conducts cross-cutting, foundational research improving the lethality, range, reliability, safety, survivability, and effectiveness of kinetic weapon systems to rapidly advance U.S. capabilities necessary for the Joint Fight. The program technology objectives include: high-speed weapon delivery, longer range precision effects, networked and collaborative systems of systems, agility at the engagement level, increased capacity / affordable munitions, survivability during delivery and target engagement, and open systems architecture. The program develops enabling technologies specific to kinetic weapon munitions (warheads, propulsion, advanced lethality mechanisms, state of the art fuzing technologies, and pioneering targeting technologies) from a Joint Service, multi-domain perspective, thus maximizing efficiencies and ensuring the development of technologies with the broadest applicability to ensure good stewardship of taxpayer dollars.

U.S. power projection capabilities are comparable to near peer adversaries, and there is an urgent need to provide U.S. warfighters with augmented or new capabilities to ensure technical superiority. The program follows a threat/opportunity analysis to develop kinetic capabilities that enable scenario-based effects from a Joint Fight perspective by exploring technological advances that are beyond Service investment risk acceptance and target asymmetric advantage. The goal is to enable military dominance to ensure effective deterrence of adversary aggression.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 2: *Applied Research*	**R-1 Program Element (Number/Name)** PE 0602000D8Z *I Joint Munitions Technology*

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 across all contested domains – air, land, sea, and space. This program's investment portfolio has been aligned to complement, and utilize, the Department's priority technology areas.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	19.306	19.409	19.833	-	19.833
Current President's Budget	19.092	24.397	19.591	-	19.591
Total Adjustments	-0.214	4.988	-0.242	-	-0.242
• Congressional General Reductions	-	-0.012			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	5.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.211	-			
• Program Adjustments	-	-	-0.242	-	-0.242
• Cancelled Account	-0.003	-	-	-	-

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2020	FY 2021
Project: 076: *Enhanced Munitions*		
Congressional Add: *Advanced Energetics Long Range Munitions*	-	5.000
Congressional Add Subtotals for Project: 076	-	5.000
Congressional Add Totals for all Projects	-	5.000

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 2	R-1 Program Element (Number/Name) PE 0602000D8Z / *Joint Munitions Technology*	Project (Number/Name) 000 / *Insensitive Munitions*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
000: *Insensitive Munitions*	-	12.924	0.000	0.000	-	0.000	-	-	-	-	-	-

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 are used to guide investments based on goals consistent with the DoD priorities. These 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 Program Executive Offices (PEOs).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Enhanced Munitions (previously Insensitive Muntions)	12.924	-	-
Description: Enhanced Munitions focuses on the following key areas: - High Performance Propulsion – Develops technologies to improve weapon range and speed, rocket motors with Ammonium Perchlorate, with or without a metal fuel, for rockets and missiles launched from air, ground, and sea platforms as well as advanced air breathing systems. - Minimum Signature Rocket Propulsion (MSP) - focuses on the development and demonstration of technologies to improve range and speed of minimum signature propellant missiles. - Area Effects Warheads (AEW) - focuses on the development of technologies to enhance the lethality of blast/ fragmentation munitions. - Hard Target Effects Warheads (HTEW) - focuses on the development of explosive ingredients, explosives, and warhead technologies for improving performance of Anti-armor warhead munitions. - Gun Propulsion (GP) - focuses on the development and demonstration of propellant, case, and igniter technologies for improved gun propulsion. FY 2020 Accomplishments: - Evaluated novel ingredients to increase conventional propellant burn rate for extended range across a suite of munitions. Completed the initial testing of a new large diameter, tactical engine for future extended range systems. Demonstrated the			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602000D8Z / *Joint Munitions Technology*	**Project (Number/Name)** 000 / *Insensitive Munitions*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
printing of a new rocket propellant for use in boost motors for high speed weapons. Demonstrated binder system for advanced boost motors with increased service life. - Evaluated proven binder materials for a missile propellant that can be used in multiple minimum signature applications. Down-selected modified high sensitivity formulations to six candidates to compare against baseline propellant and conduct performance testing. Formulated propellant using novel ingredients and advanced processing to reduce risk. - Completed initial designs on additively manufactured fragmenting warheads to tailor fragment size and increase fragment velocity. Performed modelling and simulation effort to investigate small scale detonations for improved pressure and lethality. Began evaluation of new ingredients in novel explosives for high energy warheads. - Produced precursor materials for new novel explosive material and produced 10 kg of new material, for studies to ensure viability and optimized material. Evaluated very fine grain novel material for use with multiple binder systems for increased performance and penetration. - Investigated a pressed cured explosive utilizing a unique binder system to be formulated with multiple nitramines. Completed development of a dual explosive shaped charge jet for improved performance. - Investigated novel solvent-less processing for improved thermal properties and tailored energy release. Developed a continuous process to produce a novel energetic plasticizer that is more energetic than current materials. Acquired and began formulation work with a new form of nitrocellulose (NC) that will potentially increase gun propellant energy and simplify gun propellant production for small and medium caliber gun propulsion systems.			
Accomplishments/Planned Programs Subtotals	12.924	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 2	R-1 Program Element (Number/Name) PE 0602000D8Z / *Joint Munitions Technology*	Project (Number/Name) 204 / *Enabling Fuze Technology*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
204: *Enabling Fuze Technology*	-	6.168	6.288	0.000	-	0.000	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

This RDT&E effort strategically develops fuze-enabling technologies needed to develop weapons that address Joint fight capability areas including ones highlighted by the Office of the Under Secretary of Defense for Research and Engineering (OUSD(R&E)) Munitions Science and Technology (S&T) Joint strategy and Technology-Focused Modernization such as High Speed Weapons, Networked Munitions, Air Defense and Scalable Lethality. This effort identifies and matures fuze enabling technologies at the laboratory scale and transitions them into Budget Activity (BA) 6.3 technology maturation and demonstration programs.

The Joint Fuze Technology Program (JFTP) investments are focused on four fuze capability areas that reflect U.S. fuzing capability gaps: 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 2020	FY 2021	FY 2022
Title: Enabling Fuze Technology	6.168	6.288	0.000

Description: Enabling fuze technology focuses on the following areas:
- 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.
- 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, and embedded fuzing for high speed/penetrating weapons.
- High Reliability Safe and Arm Technology - develops high reliability common fuzing architectures, miniature/high efficiency munitions power sources, and Unexploded Ordnance (UXO) reduction features.
- Target Detection and Burst Point Control - develops sensing and algorithm foundational technologies for precision target detection while meeting or exceeding the performance of existing technologies in order to operate in contested and high speed weapon environments.

FY 2020 Accomplishments:
- Completed research that establish foundational knowledge and feasibility of application of Doppler Synthetic Aperture Radar (SAR) for very high speed weapons applications.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602000D8Z / *Joint Munitions Technology*	**Project (Number/Name)** 204 / *Enabling Fuze Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
- Developed highly efficient proximity fuze RADAR signal processing algorithms and associated hardware architectures to create minimally sized affordable tracking proximity sensors. - Developed foundational knowledge of using acoustic wireless power transfer to enable embedding fuzing in the warhead explosive fill to replace complex weapon cabling. ***FY 2021 Plans:*** - Conduct High G characterization testing for establishing design guidelines of ruggedizing fuzes in high shock environment. - Demonstrate highly reliable and robust safe and arm sensors for High Speed and Counter Unmanned Aerial System (UAS) weapons. - Demonstrate non-RF detection and advanced algorithm technologies for fuzing applications for Air Defense and Counter-Unmanned Aerial System (c-UAS) weapons. ***FY 2022 Plans:*** Enabling fuze technology work and resourcing planned for FY 2022 will be transferred to Project Code 076 Enhanced Munitions as a technical area under the Joint Enhanced Munitions Program. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Funding re-aligned to Project Code 076 to merge the JFTP and JEMTP efforts.			
Accomplishments/Planned Programs Subtotals	6.168	6.288	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 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 2	R-1 Program Element (Number/Name) PE 0602000D8Z / *Joint Munitions Technology*	Project (Number/Name) 076 / *Enhanced Munitions*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
076: *Enhanced Munitions*	-	0.000	18.109	19.591	-	19.591	-	-	-	-	-	-

Note

New project code beginning in FY 2021. Funding was realigned from P000 Insensitive Munitions.

A. Mission Description and Budget Item Justification

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

Through FY 2021, 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 National Defense Strategy. The improved performance technologies developed, 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 Program Executive Offices (PEOs).

In FY 2022, the Joint Fuze Technology Program (JFTP) and JEMTP will merge and the program scope will expand to exploit technology developments such as (hypersonics, machine learning, artificial intelligence, quantum computing, etc.) and accelerate their application to enable next generation kinetic weapons capabilities in the areas of energetic materials (EM), advanced propulsion (AP), warhead effects (WE), enabling fuze technologies (FT), and pioneering targeting technologies (TT) with a specific focus on enhancing kinetic weapons lethality, range and resultant effects. The program will retain tri-service leadership to inform technology investments accelerating development across the Department. Investments will be informed by a threat-opportunity based analysis that focuses on developing weapons systems that exploit technology dominance to ensure military objectives in Joint Force campaign scenarios. New technology roadmaps for munition technical areas will guide investments consistent with the DoD National Defense Strategy and inform Service technology investments.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Enhanced Munitions	-	13.109	19.591
Description: Enhanced Munitions focuses on the following key areas: - High Performance Propulsion – Develops technologies to improve weapon range and speed, rocket motors with Ammonium Perchlorate, with or without a metal fuel, for rockets and missiles launched from air, ground, and sea platforms as well as advanced air breathing systems. - Minimum Signature Rocket Propulsion (MSP) - focuses on the development and demonstration of technologies to improve the range and speed of minimum signature propellant missiles launched from air, ground, and sea platforms.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602000D8Z / *Joint Munitions Technology*	**Project (Number/Name)** 076 / *Enhanced Munitions*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
- Area Effects Warheads (AEW) - focuses on the development of technologies to improve the lethal effectiveness and reduce the size and weight of Area Effects munitions. - Hard Target Effects Warheads (HTEW) - focuses on the development of explosive ingredients, explosives, and warhead technologies to improve the performance of penetrator munitions. - Gun Propulsion (GP) focuses on the development of technologies in the area of GP systems to improve the range and/or time to target of all gun launched munitions to include tank/mortar and medium/large caliber propulsion systems, as well as shoulder launched weapon systems. ***FY 2021 Plans:*** - Complete small-scale safety testing and larger scale characterization testing of novel propellant material. Scale-up and test 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. Complete sub-scale and start full scale testing on novel propulsion system - Conduct small-scale safety testing and scale up to 50 gram batches novel reduced smoke propellant. Integrate novel mixing methods to create formulations using proven binder materials for eventual demonstration in future air-to-ground missile systems. - Complete modeling and simulation, as well as small-scale testing on novel explosive initiation technique. Conduct hydrocode modeling of unique large projectile warhead design with improved lethality. - Complete 50 gram scale-up batches of explosive formulations for testing and down-selection to two formulations. - Complete formulation, interior ballistics modelling, and small-scale tests of coextruded propellant. Complete lab-scale evaluation of advanced coatings for improved performance at cold temperature and scale up to 40 pound batches of materials. ***FY 2022 Plans:*** In FY 2022, the JFTP will merge with the JEMTP, and the program scope will expand to holistically address S&T that will enable next generation kinetic weapons capabilities, specifically, energetic materials, advanced propulsion, warhead lethal effects, enabling fuze technologies, and advanced targeting. Existing projects will be realigned to the new program structure and re-competed against potential new efforts program-wide. - Fabricate test motors with novel propellant material and validate improved performance. Complete full scale testing on novel propulsion system, to prepare for demonstration transition. - Prepare full-scale demonstration and complete testing on novel explosive initiation technique. - Complete structural modeling, fabrication, loading, and testing of first series improved lethality warhead. - Scale-up explosive formulations to complete cylinder expansion and set-back testing. - Develop critical fuze component and munitions technologies for embedded, smart fuzes to enable networked weapons effects and precision warhead detonation.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602000D8Z / *Joint Munitions Technology*	**Project (Number/Name)** 076 / *Enhanced Munitions*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
- Develop additively manufactured fuzing radome technology to enhance target detection performance and resistance to jamming in contested environments. - Develop new multi-mode ultrafast targeting algorithms exploiting advancements in microelectronics and materials. - Develop technologies to enable collaborate weapons communication and networking facilitating improved guidance, target detection, and weapons effectiveness. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Funding re-aligned from Project Code 204 to merge JFTP and JEMTP efforts in Project Code 076.			
Accomplishments/Planned Programs Subtotals	-	13.109	19.591

	FY 2020	FY 2021
Congressional Add: Advanced Energetics Long Range Munitions	-	5.000
FY 2021 Plans: - Explore advanced energetics concepts and accelerate development of new explosive and propellant materials to drive improvements to the performance, range, and lethality of weapons. - Application of machine learning tools and techniques for advanced energetics discovery and applied research of energetics suitable for long range/high speed munitions propellant applications.		
Congressional Adds Subtotals	-	5.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

THIS PAGE INTENTIONALLY LEFT BLANK

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 2: *Applied Research*	**R-1 Program Element (Number/Name)** PE 0602230D8Z / *Defense Technology Innovation*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	9.989	0.000	17.476	22.918	-	22.918	-	-	-	-	-	-
835: *Defense Technology Innovation*	9.989	0.000	17.476	0.000	-	0.000	-	-	-	-	-	-
230: *Beyond 5G*	-	0.000	0.000	22.918	-	22.918	-	-	-	-	-	-

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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	35.000	23.000	-	23.000
Current President's Budget	0.000	17.476	22.918	-	22.918
Total Adjustments	0.000	-17.524	-0.082	-	-0.082
• Congressional General Reductions	-	-17.524			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Program Adjustment	-	-	-0.082	-	-0.082

Change Summary Explanation

The decrease in FY 2021 is due to funding of higher priority initiatives.

No significant changes in FY 2022.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 2	R-1 Program Element (Number/Name) PE 0602230D8Z / *Defense Technology Innovation*	Project (Number/Name) 835 / *Defense Technology Innovation*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
835: *Defense Technology Innovation*	9.989	0.000	17.476	0.000	-	0.000	-	-	-	-	-	-

Note

Funding in FY 2022 will be under new Project Code 230, to change the Project Code title to "Beyond 5G." The requirement and efforts remain unchanged.

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. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Beyond 5G	-	17.476	-
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 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. ***FY 2021 Plans:*** 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 invest in applied research in Beyond 5G, through collaborative mechanisms such as co-investment in early-stage technology testbeds, novel hardware and software components for sustained long-term leadership and fellowship/training programs for Beyond 5G workforce development. DoD will initiate research and development in the following areas: • Radio Frequency (RF) and large-scale multi-antenna systems for higher millimeter wave/THz bands, • Novel adaptive machine learning concepts for achieving extreme spectrum reuse and network resource allocation, • Use of all available spectral degrees of freedom in contested/congested spectrum environments to enable highly dynamic spectrum utilization,			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602230D8Z / *Defense Technology Innovation*	**Project (Number/Name)** 835 / *Defense Technology Innovation*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
• Robust, reconfigurable, and secure software-defined Beyond 5G network management techniques to enable more dynamic networks, • Edge computing for low latency, mission critical Next G DoD CONOPs. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Funding in FY 2022 is re-aligned to new Project Code 230.			
Accomplishments/Planned Programs Subtotals	-	17.476	-

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 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 2	R-1 Program Element (Number/Name) PE 0602230D8Z / *Defense Technology Innovation*	Project (Number/Name) 230 / *Beyond 5G*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
230: *Beyond 5G*	-	0.000	0.000	22.918	-	22.918	-	-	-	-	-	-

Note

Funding in FY 2022 will be under new Project Code 230, to change the Project Code title to "Beyond 5G." The requirement and efforts remain unchanged.

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. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Beyond 5G	-	-	22.918
Description: Continue to 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 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. ***FY 2022 Plans:*** DoD will continue this investment through the collaborative mechanisms with NSF and NIST noted above – in early-stage technology testbeds, novel hardware and software components, and fellowship/training programs. DoD will broadly continue initiatives in the FY 2021 areas: • Radio Frequency (RF) and massive MIMO technology, • Spectrum reuse/network resource utilization based on novel machine learning concepts, • Highly dynamic spectrum sharing using multiple degrees of freedom in contested/congested scenarios, • Robust, reconfigurable, and secure software-defined networking, • Edge computing for ultra-reliable, low latency applications.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602230D8Z / *Defense Technology Innovation*	**Project (Number/Name)** 230 / *Beyond 5G*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
DoD will adapt its R&D investment strategy/award mix based on the companion Prototyping and Experimentation testbed deployments. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Efforts re-aligned from Project Code 835 beginning in FY 2022.			
Accomplishments/Planned Programs Subtotals	-	-	22.918

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

THIS PAGE INTENTIONALLY LEFT BLANK

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 2: *Applied Research*	**R-1 Program Element (Number/Name)** PE 0602234D8Z / *Lincoln Laboratory*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	-	50.685	41.053	55.692	-	55.692	-	-	-	-	-	-
534: *Lincoln Laboratory*	-	40.786	37.553	52.192	-	52.192	-	-	-	-	-	-
535: *Technical Intelligence*	-	6.507	0.000	0.000	-	0.000	-	-	-	-	-	-
815: *Cyber Security, Science and Engineering*	-	3.392	3.500	3.500	-	3.500	-	-	-	-	-	-

Note

Funding realigned from project code 535 to PE 0603288D8Z, project code 177, Technology Watch/Horizon Scan, in FY 2021 in accordance with the OUSD(R&E) reorganization.

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 for Research and Engineering (OUSD(R&E)), are aligned with DoD Communities of Interest (CoIs), 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 long-standing 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 under 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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	52.317	41.080	42.176	-	42.176
Current President's Budget	50.685	41.053	55.692	-	55.692
Total Adjustments	-1.632	-0.027	13.516	-	13.516
• Congressional General Reductions	-	-0.027			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-1.623	-			
• Program Adjustment	-	-	13.516	-	13.516
• Cancelled Account	-0.009	-	-	-	-

Change Summary Explanation

FY 2022 increase in for Emerging Artificial Intelligence Capabilities.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense									Date: May 2021			
Appropriation/Budget Activity 0400 / 2					R-1 Program Element (Number/Name) PE 0602234D8Z / *Lincoln Laboratory*				Project (Number/Name) 534 / *Lincoln Laboratory*			
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
534: *Lincoln Laboratory*	-	40.786	37.553	52.192	-	52.192	-	-	-	-	-	-

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 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602234D8Z / *Lincoln Laboratory*	**Project (Number/Name)** 534 / *Lincoln Laboratory*

The Lincoln Laboratory will discontinue Line funding for the Biomedical Sciences and Technology (BST) area starting in FY 2021.

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 DoD warfare domains, including space, air, land, sea surface, and undersea.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Advanced Devices	4.886	5.050	5.100
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 2021 Plans:*** 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 2022 Plans:*** The Advanced Devices program will continue many of its ongoing efforts with the goal of advancing this applied research to a stage where it can be transitioned to other programs. In particular, it is expected that nearer-term transition opportunities will be developed for the imager, sync processor, and millimeterwave photonic signal processor work in order to expand the development efforts for these technologies. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Changes reflect minor budget fluctuations.			
Title: Optical Systems and Technologies	5.233	5.385	5.500
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			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602234D8Z / *Lincoln Laboratory*	**Project (Number/Name)** 534 / *Lincoln Laboratory*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
revolutionary technologies in the traditional DoD mission areas such as intelligence, surveillance, and reconnaissance (ISR), space control, communications, and ballistic missile defense. ***FY 2021 Plans:*** Areas of emphasis will include computational imaging, laser and LIDAR technologies, free-space communication technologies, and space surveillance capabilities. ***FY 2022 Plans:*** The Optical Systems Technology program will continue to solicit advanced technologies in lasers and receivers as well as in novel optical systems and architectures for next-generation capabilities for national security challenges. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Changes reflect minor budget fluctuations.			
Title: Radio Frequency (RF) Systems and Technologies	4.032	4.180	4.200
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. ***FY 2021 Plans:*** 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. ***FY 2022 Plans:*** The RF Systems program will continue to focus research on advanced RF technologies in support of emerging needs for radar, SIGINT, communications, and EW systems. ***FY 2021 to FY 2022 Increase/Decrease Statement:***			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602234D8Z / *Lincoln Laboratory*	**Project (Number/Name)** 534 / *Lincoln Laboratory*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Changes reflect minor budget fluctuations.			
Title: Information, Computation, and Exploitation Sciences	5.530	5.653	5.806
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 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. ***FY 2021 Plans:*** 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. ***FY 2022 Plans:*** The Information, Computation, and Exploitation Sciences program will continue applied research and development along several key technical thrusts, including predictive and prescriptive analytics, automated Processing, Exploitation and Dissemination (PED), advanced computing technologies, and human-machine teaming, all within the context of the AI oriented decision support architecture. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Changes reflect minor budget fluctuations.			
Title: Biomedical Sciences and Technology	4.722	-	-
Description: This project area focuses on advancing research and development in biosciences and biotechnology for DoD applications and 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.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602234D8Z / *Lincoln Laboratory*	**Project (Number/Name)** 534 / *Lincoln Laboratory*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
The Biomedical Sciences and Technology program was eliminated in FY 2021 to focus on the core and emerging technology areas that are more tightly coupled to the laboratories' core competencies.			
Title: Autonomous Systems	3.832	3.980	4.055
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. ***FY 2021 Plans:*** 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. ***FY 2022 Plans:*** The focus of decision-making and teaming in complex environments will continue; research will continue to improve current autonomous and AI-enabled 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. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Changes reflect minor budget fluctuations.			
Title: Quantum System Sciences	4.827	4.975	5.079
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 science efforts are establishing a robust scientific foundation. On this foundation, application-oriented developments important for national security are being fostered. ***FY 2021 Plans:***			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602234D8Z / *Lincoln Laboratory*	**Project (Number/Name)** 534 / *Lincoln Laboratory*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
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. ***FY 2022 Plans:*** Future work in the program will focus on the underlying scientific and engineering issues of quantum system science. The Quantum System Sciences program will focus on other applied research topics in quantum information, including emerging modalities, interfaces between multiple quantum modalities, and quantum processing architectures. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Changes reflect minor budget fluctuations.			
Title: Advanced Materials and Processes ***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. ***FY 2021 Plans:*** 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 materials science and all forms of data-enhanced, accelerated materials development are expected to be emerging areas of interest. ***FY 2022 Plans:*** The Advanced Materials and Process program will continue to conduct research on all forms of data-enhanced, computationally accelerated materials development, alongside focus on advanced materials technologies that underpin small platforms. The program will continue to see the impact of multiscale, multi-material additive manufacturing, as well as other novel processes that combine materials in innovative ways, and expect these to have a major influence on DoD systems in the next few years. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Changes reflect minor budget fluctuations.	3.015	3.165	3.216
Title: Integrated Systems	4.709	5.165	5.236

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602234D8Z / *Lincoln Laboratory*	**Project (Number/Name)** 534 / *Lincoln Laboratory*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
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. ***FY 2021 Plans:*** This project area will continue to support efforts that innovate at the system level through architecture, design, and/or introduction of new technologies. ***FY 2022 Plans:*** The Integrated Systems program will continue to support projects that innovate at the system level through architecture, design, and/or introduction of new technologies. The projects will be those of strategic interest to the DoD and aligned with Lincoln Laboratory mission areas. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Changes reflect minor budget fluctuations.			
Title: Emerging Artificial Intelligence Capabilities ***Description:*** This project area funds the emerging Artificial Intelligence (AI) needs of the Department of Defense in addressing critical operational and research areas. The Artificial intelligence approach addresses both the immediate operational issues as well as the long-term research requirements of the Department. However, significant gaps exist both in the ability to understand and apply AI at the tactical edge, democratized AI development across the Department, and use new AI approaches to improve the innovation ecosystem. ***FY 2022 Plans:*** This project will explore engineering and training requirements for deploying and retraining machine learning tools at the tactical edge and demonstrating such capabilities in operationally relevant environments. Efforts will include the demonstration of collaborative AI at the Edge capability with our allies as well as a demonstration of agile command and control software/AI development, accelerating research through to experimentation. This project will also develop and demonstrate in an operational environment a standard development toolset to democratize AI development in the Department, including T&E toolsets for bias and adversarial AI vulnerability analysis. The project will also fund a challenge project to demonstrate accelerating Scientific Discovery through Artificial Intelligence. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Increase in FY 2022 for Emerging Artificial Intelligence Capabilities.	-	-	14.000
Accomplishments/Planned Programs Subtotals	40.786	37.553	52.192

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602234D8Z / *Lincoln Laboratory*	**Project (Number/Name)** 534 / *Lincoln Laboratory*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense										Date: May 2021		
Appropriation/Budget Activity 0400 / 2					R-1 Program Element (Number/Name) PE 0602234D8Z / *Lincoln Laboratory*				Project (Number/Name) 535 / *Technical Intelligence*			
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
535: *Technical Intelligence*	-	6.507	0.000	0.000	-	0.000	-	-	-	-	-	-

Note

Funding realigned from project code 535 to PE 0603288D8Z, project code 177, Technology Watch/Horizon Scan, in FY 2021 in accordance with the OUSD(R&E) reorganization.

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 2020	FY 2021	FY 2022
Title: Technical Intelligence	6.507	-	-
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.			
Accomplishments/Planned Programs Subtotals	6.507	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602234D8Z / *Lincoln Laboratory*	**Project (Number/Name)** 535 / *Technical Intelligence*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 2	R-1 Program Element (Number/Name) PE 0602234D8Z / *Lincoln Laboratory*	Project (Number/Name) 815 / *Cyber Security, Science and Engineering*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
815: *Cyber Security, Science and Engineering*	-	3.392	3.500	3.500	-	3.500	-	-	-	-	-	-

Note

Changes reflect minor budget fluctuations.

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 2020	FY 2021	FY 2022
Title: Cyber Security, Science and Engineering	3.392	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 2021 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602234D8Z / *Lincoln Laboratory*	**Project (Number/Name)** 815 / *Cyber Security, Science and Engineering*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
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. ***FY 2022 Plans:*** The Cyber Security, Science and Engineering program will continue to develop far-reaching cyber improvements that will significantly improve our interactions with the cyber world. The program will continue to extend the Resilient Mission Computer and Automatic Cryptographic Data-Centric Security projects and their successors to deliver game-changing cyber capabilities, further develop cyber exploitation and analytic capabilities, and continue to anticipate a future expansion to adversarial and offensive AI capabilities. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** No changes.			
Accomplishments/Planned Programs Subtotals	3.392	3.500	3.500

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 2: *Applied Research*	**R-1 Program Element (Number/Name)** PE 0602251D8Z *I Applied Research for the Advancement of S&T Priorities*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	-	58.450	53.359	65.015	-	65.015	-	-	-	-	-	-
227: *Applied Research for the Advancement of S&T Priorities*	-	58.450	53.359	65.015	-	65.015	-	-	-	-	-	-

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, develop Department of Defense (DoD) expertise in emerging technology areas, and build DoD facility capabilities. The PE focuses on the design, development, and improvement of 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 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) multi-agency collaboration and coordination. The S&T CoIs produce Joint S&T Roadmaps to contribute to the Office of the Under Secretary of Defense for Research and Engineering (OUSD(R&E)) Modernization Priority Roadmaps.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	60.400	60.722	60.740	-	60.740
Current President's Budget	58.450	53.359	65.015	-	65.015
Total Adjustments	-1.950	-7.363	4.275	-	4.275
• Congressional General Reductions	-	-7.363			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-1.940	-			
• Undistributed Reduction - Excess to Need	-0.010	-	-	-	-
• Program Adjustment	-	-	4.275	-	4.275

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2020	FY 2021
Project: 227: *Applied Research for the Advancement of S&T Priorities*		
Congressional Add: *Per- and Polyfluoroalkyl Substances (PFAS) Modeling*	7.000	-

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 2: *Applied Research*	**R-1 Program Element (Number/Name)** PE 0602251D8Z *I Applied Research for the Advancement of S&T Priorities*

Congressional Add Details ($ in Millions, and Includes General Reductions)

	FY 2020	FY 2021
Congressional Add Subtotals for Project: 227	7.000	-
Congressional Add Totals for all Projects	7.000	-

Change Summary Explanation

FY 2022 increase for the Power Thermal Management project.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 2	R-1 Program Element (Number/Name) PE 0602251D8Z / *Applied Research for the Advancement of S&T Priorities*	Project (Number/Name) *227 / Applied Research for the Advancement of S&T Priorities*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
227: *Applied Research for the Advancement of S&T Priorities*	-	58.450	53.359	65.015	-	65.015	-	-	-	-	-	-

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 S&T Communities of Interest (CoIs) to address technology gaps or opportunities; and (3) 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 joint strategic S&T oversight and multi-Service, multi-agency collaboration and coordination.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Applied Research for the Advancement of S&T Priorities (ARAP)	45.250	48.559	55.215

Description: The program focuses on cross-cutting S&T efforts that foster tri-service research areas of common interest that give the joint warfighter a technological advantage. It focuses on emerging areas of science, building expertise within the DoD laboratories, including investment in laboratory infrastructure and people, and on research areas that are a foundation for further investments by the Services following the completion of the projects.

Cross-cutting efforts are aligned with S&T Priorities, such as Electronic Warfare, Human Systems, Autonomy, Space, Kinetic Weapons, Directed Energy and Non-Lethal Weapons, Cyber, Sensors and Processing, Command, Control, Communications, Computers and Intelligence, Air Platforms, and Ground and Sea Platforms, as well other focus areas, such as Materials and Manufacturing Processes, Advanced Electronics, Energy and Power Technologies, Biotechnology, and Armed Services Biomedical Research Evaluation and Management.

FY 2021 Plans:

Continue to fund current ARAP projects: (1) Enhanced Energetics Effects (EEE) (Year 3 of 3); (2) Topologically Enabled Devices (TEDs) (Year 2 of 3); and (3) A Combined Development Pipeline for Novel Neuromorphic Hardware (NeuroPipe) (Year 1 of 3).

(1) Enhanced Energetics Effects:
- Develop Machine-Learned (ML) computational tools to predict synthetic chemical routes for energetic molecules to predict simple pathways. The database is being augmented for synthesis of more exotic energetics. Also building a database for predicting propellant burn rates using ML tools.
- Scale up novel forms of the most energetic explosive ingredients to be transitioned to a production facility.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602251D8Z / *Applied Research for the Advancement of S&T Priorities*	**Project (Number/Name)** *227 / Applied Research for the Advancement of S&T Priorities*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
- Develop Additive Manufacturing (AM) feed-stocks and mixing print heads, using improved topology optimization computations to design best AM energetic structures to print. - Prepare and scale up new rocket propellant formulations for rocket motor testing. - Improve ML computational tools and make accessible to synthesis chemists. - Formulate novel forms of the most-energetic explosive ingredient into explosives to provide high brisance and into propellant formulations to increase range. - Print a gun-projected, rocket-propelled, fragmenting warhead as a demonstrator of AM of energetics, metal weapon cases and flexible electronics. - Transition new rocket propellants to industry and test at the seven-inch motor scale. (2) Topologically-Enabled Devices (TEDs): - Continue material growth and processing investigations to complete material combination down-select for transistor, memory, and optoelectronic devices. - Demonstrate initial functioning prototype topological electronic and optoelectronic components. - Develop test beds and establish test procedures at each agency for joint Year 3 demonstration projects in Terahertz speed electronics, non-volatile memory, infrared communications and sensing, and miniaturized integrated optoelectronics. (3) A Combined Development Pipeline for Novel Neuromorphic Hardware (NeuroPipe): - Develop software for first test memristor chip. - Develop spiking neuron network (SNN) models for two types of memristors. - Develop SNN algorithms. - Develop infrastructure for heterogonous device design, oxide memristor processing, 2D materials based heterogonous device design, organic/inorganic materials integration, and large scale deposition of ferroelectric materials. Select and initiate a new FY 2021 ARAP project. Continue to fund current seedlings projects, including: (1) Optical Multi-Channel Beamforming for Electronic Warfare (year 2 of 2); (2) 150 Volt Ultra-Wide Bandgap High-Efficiency RF Amplifier Technology (year 2 of 2); (3) Establishing the Critical Tests for Machine Understanding for Human-Machine Teaming (year 2 of 2). Select up to three new FY 2021 seedling projects (to be identified in 3rd Quarter FY 2020). ***FY 2022 Plans:*** Continue ARAP projects, including: (1) Topologically Enabled Devices (TEDs) (Year 3 of 3); (2) A Combined Development Pipeline for Novel Neuromorphic Hardware (NeuroPipe) (Year 2 of 3); and (3) FY 2021 project.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602251D8Z / *Applied Research for the Advancement of S&T Priorities*	**Project (Number/Name)** *227 / Applied Research for the Advancement of S&T Priorities*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
(1) Topologically-Enabled Devices (TEDs): - Continue exploration, optimization, and process development of topological electronic and magnetic materials. - Demonstrate multi-bit topological transistor and memory circuit with necessary integration and packaging. - Demonstrate polarization sensitive topological optoelectronic sensors for communication and LiDAR imaging. - Integrated topological laser demonstration on atomic clock chip. (2) A Combined Development Pipeline for Novel Neuromorphic Hardware (NeuroPipe): - Design and mask tape-out of Complementary metal-oxide semiconductor (CMOS) front-end (first test chip), Nanophotonic reservoir computing device (tunable coupling and dynamical stability in network of five nanolasers) - Demonstrate reservoir computing with single time-multiplexed nanolaser node - Develop Memristor spiking neural networks (SNN) hardware - Develop novel memristor material/device testbed or for CMOS first test chip - Develop ion-gated memristors test hardware operating with different weight levels, high frequency switching for 100 100 devices - Demonstrate reconfigurability up to 10 weight levels and 10mV resolution. (3) Continue FY 2021 ARAP project to be selected during FY 2021. Select and initiate a new FY 2022 ARAP project. Continue up to three seedling programs awarded in FY 2021. Select and initiate a new FY 2022 seedling project (to be identified in 3rd Quarter FY 2022). ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Changes reflect the selection and initiation of a new FY 2022 seedling project.			
Title: S&T Communities of Interest (CoIs)	6.200	4.800	4.800
Description: The S&T CoIs facilitate coordination and collaboration across Components to reduce duplication and optimize the development of critical S&T efforts across the DoD enterprise. Their efforts include the development of joint S&T roadmaps and the planning of technology integration. The CoIs assess and address capability gaps and their multi-domain operational impact. ***FY 2021 Plans:*** Continue to provide support to the CoIs, i.e., Advanced Electronics; Air Platforms; Autonomy; Armed Services Biomedical Research Evaluation and Management. Biotechnology; Command, Control, Communications, Computers, and Intelligence (C4I);			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602251D8Z / *Applied Research for the Advancement of S&T Priorities*	**Project (Number/Name)** *227 / Applied Research for the Advancement of S&T Priorities*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Cyber; Directed Energy - Non-Lethal Weapons; Electronic Warfare; Energy and Power; Ground and Sea Platforms; Human Systems; Kinetic Weapons; Materials and Manufacturing Processes; Sensors and Processing; and Space. ***FY 2022 Plans:*** Continue to provide support to the CoIs, i.e., Advanced Electronics; Air Platforms; Autonomy; Armed Services Biomedical Research Evaluation and Management. 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; Materials and Manufacturing Processes; Sensors and Processing; and Space. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** No changes.			
Title: Power Thermal Management ***Description:*** The program focuses on cross-cutting power and thermal Applied Research efforts that enable integration of high-power and high-energy mission systems on platforms. The program pursues solutions to challenges or gaps in power and thermal technologies, research areas and DoD laboratory expertise, including investment in laboratory infrastructure and people, that are a foundation for platform-integrated and fielded capability. Cross-cutting efforts include power and thermal technologies and subcomponents that support more than one domain (air, sea, land, or space) or address power and thermal technologies required for standardization to broadly realize capability across multiple platforms. ***FY 2022 Plans:*** Investigate and mature technologies that enable cross-domain solutions for large-scale energy storage on platforms in a manner that is safe and scalable and delivers power and energy densities appropriate for advanced mission systems. Support cross-domain modeling of power and thermal architecture necessary to assess challenges and advance emerging thermal technologies that enable advanced mission systems. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The FY 2022 increase reflects program initiation.	-	-	5.000
Accomplishments/Planned Programs Subtotals	51.450	53.359	65.015

	FY 2020	FY 2021
Congressional Add: Per- and Polyfluoroalkyl Substances (PFAS) Modeling	7.000	-

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602251D8Z / *Applied Research for the Advancement of S&T Priorities*	**Project (Number/Name)** *227 / Applied Research for the Advancement of S&T Priorities*

	FY 2020	FY 2021
FY 2020 Accomplishments: Development of Novel Modeling Approaches for Rapid Risk Characterization of PFAS and PFAS alternatives ($4.000 million): - Completed initial artificial intelligence model for identification of PFAS surrogate chemicals. - Identified computational models for human uptake, distribution and metabolism of PFASs. - Completed molecular calculation of physical properties of PFAS and fluorine-free alternatives. - Completed initial computational models for fish tissue concentrations of PFASs and potential adverse effects. - Complete artificial intelligence computer vision models for developmental toxicity endpoints. - Complete Human Risk model to predict PFAS effects using non-animal testing data. - Complete Fish Ecological risk model to predict PFAS effects using non-animal test data. - Complete integration of Models into Rapid PFAS Risk Decision Tool. Degradation, destruction and removal of PFAS guided through advanced computational modeling and simulation approaches and artificial intelligence (AI)/machine learning (ML) algorithms ($3.000 million): - Completed initial database of PFAS physical and chemical properties. - Developed primary thermal degradation reactions of PFAS compounds. - Completed initial computational model for PFAS absorbents. - Identified potential microbes for PFAS degradation. - Create a PFAS database using AI/ML. - Create computational models to predict thermal degradation kinetics. - Use models to predict PFAS isolation and removal efficiency of adsorbents. - Use computational models to predict chemical degradation kinetics. - Deliver microbial degradation model for PFAS.		
Congressional Adds Subtotals	7.000	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

THIS PAGE INTENTIONALLY LEFT BLANK

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 2: *Applied Research*	**R-1 Program Element (Number/Name)** PE 0602668D8Z / *Cyber Security Research*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	-	24.454	25.245	15.380	-	15.380	-	-	-	-	-	-
003: *Cyber Applied Research*	-	24.454	25.245	15.380	-	15.380	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

The Cyber Security Applied Research program element promotes innovative higher risk cyber research to address joint force challenges in full spectrum cyber operations. 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 National Defense Strategy (NDS), Department of Defense (DoD) Cyber Strategy, and Office of Under Secretary of Defense for Research and Engineering (OUSD(R&E)) Modernization - 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. The established research thrusts areas are: Behavior Cyber Science, Self-Securing Systems, Precise Cyber Effects, and Applied Mathematics for Cyber.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	25.118	15.255	15.586	-	15.586
Current President's Budget	24.454	25.245	15.380	-	15.380
Total Adjustments	-0.664	9.990	-0.206	-	-0.206
• Congressional General Reductions	-	-0.010			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	10.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.660	-			
• Program Adjustment	-	-	-0.206	-	-0.206
• Cancelled Account	-0.004	-	-	-	-

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2020	FY 2021
Project: 003: *Cyber Applied Research*		
Congressional Add: *Cyber Institutes at Institutions of Higher Learning*	10.000	10.000
Congressional Add Subtotals for Project: 003	10.000	10.000
Congressional Add Totals for all Projects	10.000	10.000

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 2	R-1 Program Element (Number/Name) PE 0602668D8Z / *Cyber Security Research*	Project (Number/Name) 003 / *Cyber Applied Research*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
003: *Cyber Applied Research*	-	24.454	25.245	15.380	-	15.380	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

Adversaries are increasingly leveling the cyber playing field by harnessing commoditized and affordable cyber tools and capabilities, while developing sophisticated and automated technologies and tactics. The DoD cyber S&T community must accelerate the pace of innovative research accordingly to maintain technological advantage. 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. This was further reinforced by the establishment of Cyber as one of USD(R&E) Modernization Areas in 2018 and development of the USD(R&E) S&T Strategy for Cyber.

This cybersecurity program element focuses on higher risk research ideas with major potential impact for addressing NDS and Modernization mission focus areas of cybersecurity. The program works to advance the state of cybersecurity by reducing risk, broadening applicability, and accelerating research in the areas of Behavioral Cyber Science; Self-Securing Systems; Precise Cyber Effects; and Applied Mathematics for Cyber. Advances in these cyber S&T thrusts will promote strong foundations, while disruptive innovations will create surprise, shape the fight, and ensure a decisive advantage. The thrusts are critical to the development of innovative and sustainable research that takes cybersecurity beyond the incremental escalation of attack and defense. The thrusts provide an opportunity to identify and advance foundational technologies to support all Services and Agencies.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: OUSD (R&E) Cyber Technologies	14.454	15.245	15.380
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. Research in Behavioral Cyber Science: Advances understanding and technical rigor of modeling and predicting human responses to cyber activities that enhance cyber operations through planning and training. Explores the interaction between computers and human behavior, moving beyond electronic signals (ones and zeroes) to enable development of new insights to human behavior. Self-Securing Systems: System, platforms, and networks will autonomously help DoD operators react more quickly to cyber-attacks. Equips 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: Provides scalable cyber options for military cyber commanders, to precisely identify and engage specific threats and targets with a high confidence of success. Provides a disproportionate advantage for cyber operational modeling,			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602668D8Z / *Cyber Security Research*	**Project (Number/Name)** 003 / *Cyber Applied Research*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
within high variability architectures. These advantages impact industrial control systems and critical infrastructures across blue, gray, and red spaces. Applied Mathematics for Cyber: Advancements in cyberspace-relevant mathematics 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. ***FY 2021 Plans:*** Behavioral Cyber Science: - Demonstrate prototype of Contextualized Operator Perspective work support system, measuring increase in Cyber Protection Team (CPT) efficiency via field exercises or at DreamPort. Impact: Achieve a support system for CPT planning, network operations, and situational awareness. Increase CPT efficiency by 2x. Self-Securing Systems: - Demonstrate and quantify a cyber-resilient command and control (C2) software defined network architecture in the U.S. Army's C2/Internet of Battle-Things environment. Pilot on Department of Defense Information Networks (DoDIN). Impact: Achieve autonomic cyber-resilience that self-hardens up to 1000x faster than current human-mediated responses (~days). - Develop ground vehicle threat and mitigation scenario, to highlight existing countermeasures to supply chain threats as part of an overall cyber resilience demonstration. Calibrate metrics to help evaluate the efficacy of combined/integrated defense techniques on simulated vehicle. Impact: Implementation of a system that uses automated reasoning to evolve securely to changes in an attacker's behavior, yielding resilience beyond limitations in current vehicle signature-based detection methods. - Consolidate data from DoD Cybersecurity S&T investment areas that address gaps and accelerate the adaptation of promising results into military vehicle platforms and commercial vehicles. The integration of the results will leverage both commercial and Government investments, to ensure solutions introduce a pipeline and supply chain, supporting adaptation. Plan for four (4) Cyber-Day construct demonstrations. Impact: Accelerate the transition of DoD S&T cybersecurity technologies into military ground vehicles and commercial fleets that serve military critical missions. Precise Cyber Effects: - Demonstrate cyber-physical system dependency using Modeling and Simulation (M&S) based discovery, and integrate improved discovery process into evolving Cyber Joint Munitions Effectiveness Manual (JMEM) within the operations community. Impact: Achieve repeatable methodology to estimate scope and severity of cyber effects, reducing uncertainty risks associated with offensive planning - improved viability will enhance model functional dependencies fundamental to estimating cyber operational risks.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602668D8Z / *Cyber Security Research*	**Project (Number/Name)** 003 / *Cyber Applied Research*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Applied Mathematics for Cyber: - Explore the use AI as a force multiplier to enhance human-machine teaming for robust decision-making, Develop AI-Augmented capabilities across Cyber-Kill chain, Build Autonomous Cyber Defense capabilities and Development of AI-Enabled Technologies for Cyber. Impact: These efforts will provide tools to outmaneuver the adversary in cyberspace; monitor and anticipate threats in real time, build trustworthy AI defenses for Cyber and faster AI model training and testing for Cyber. ***FY 2022 Plans:*** Plan for new research efforts to identify and meet objectives under the thrust areas of Behavioral Cyber Science, Self-Securing Systems, Precise Cyber Effects, and Applied Mathematics for Cyber. These efforts will explore challenges in applied research in topics such as Artificial Intelligence/Machine Learning; Countering Adversarial Machine Learning; Exploring Precise Cyber Effects at the tactical edge; and DoD cyber work force training and education. Self-Securing Systems: - Integrate formal methods into a high security and high agility DevSecOps development process. Impact: The process will help meet Departmental goal of rapidly fielding software to serve as a trust foundation for increasingly cyber resilient systems. Precision Cyber Effects: - Expand existing cyber funded research, to add ensembles helping to reduce uncertainty surrounding predicted effect types and their measured magnitudes within critical infrastructures. Examining statistics-based methods to develop more robust causality models of system performance and failure. Impact: Improved viability and utility of OCO; More precise cyber testing and verification of blue systems Applied Mathematics for Cyber: - Explore the technical rigors, science-based, repeatable, automated, and affordable methods for quantitatively measuring cyber resilience offered to military engineered artifacts. Impact: Provides quantifiable and repeatable measures for mission resilience to guide development or assessment decisions ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Changes reflect minor budget fluctuations.			
Accomplishments/Planned Programs Subtotals	14.454	15.245	15.380

	FY 2020	FY 2021
Congressional Add: Cyber Institutes at Institutions of Higher Learning	10.000	10.000
FY 2020 Accomplishments: Conducted “listening sessions” with potential stakeholders in education and defense sectors to identify and assess existing cyber education programs, as well as current and future		

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602668D8Z / *Cyber Security Research*	**Project (Number/Name)** 003 / *Cyber Applied Research*

	FY 2020	FY 2021
workforce needs. Developed Plan of Action and Milestones to establish a new "Virtual Institutes for Cyber and Electromagnetic Spectrum Research and Employ" (VICEROY) program to meet the Congressional mandate of "accelerating and focusing the development of foundational expertise in critical cyber operational skills for future military and civilian leaders of the Armed Forces and the Department of Defense." Selected non-profit partnership intermediary to administer the VICEROY program and engage academia on our behalf. Obligated funds under a Partnership Intermediary Agreement and issued a special notice soliciting proposals for the first cohort of VICEROY cyber institutes. Anticipated awards stemming from this special notice made in 2Q FY 2021. ***FY 2021 Plans:*** - Complete sub-awards for FY 2020 VICEROY Institutes cohort by 2Q FY 2021. The cross service/component source selection team evaluated proposals to identify top candidates under the first tranche of funding, with execution beginning in 3Q FY 2021. - Develop and release a solicitation for FY 2021 proposals from higher learning institutes interested joining the virtual cyber institutes cohort. Post solicitation in 2Q FY 2021 with the goal of completing the sub-awards in 3Q FY 2021. - Convene first VICEROY symposium in Q4 FY 2021 to connect virtual institute member organizations with the DoD governance board. Symposium planned as an in-person event but in the event of COVID-19 restriction will move to alternative virtual event.		
Congressional Adds Subtotals	10.000	10.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

THIS PAGE INTENTIONALLY LEFT BLANK

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 2: *Applied Research*	**R-1 Program Element (Number/Name)** PE 0602751D8Z / *Software Engineering Institute (SEI) Applied Research*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	-	9.232	9.567	9.601	-	9.601	-	-	-	-	-	-
278: *Software Engineering Institute (SEI) Applied Research*	-	7.669	8.573	8.627	-	8.627	-	-	-	-	-	-
817: *Cyber Security, Applied Research*	-	1.563	0.994	0.974	-	0.974	-	-	-	-	-	-

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 Department of Defense (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 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 2: *Applied Research*	**R-1 Program Element (Number/Name)** PE 0602751D8Z *I Software Engineering Institute (SEI) Applied Research*

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	9.580	9.573	9.712	-	9.712
Current President's Budget	9.232	9.567	9.601	-	9.601
Total Adjustments	-0.348	-0.006	-0.111	-	-0.111
• Congressional General Reductions	-	-0.006			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.346	-			
• Cancelled Account	-0.002	-	-	-	-
• Program Adjustment	-	-	-0.111	-	-0.111

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 2	R-1 Program Element (Number/Name) PE 0602751D8Z / *Software Engineering Institute (SEI) Applied Research*	Project (Number/Name) 278 / *Software Engineering Institute (SEI) Applied Research*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
278: *Software Engineering Institute (SEI) Applied Research*	-	7.669	8.573	8.627	-	8.627	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

Work conducted under this Program Element (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 Department of Defense (DoD) in retaining a long-term advantage in the areas of software-intensive systems and cyber security by enhancing assurance, exploiting automation and Artificial Intelligence (AI), and understanding human-computer interaction.

The Software Engineering Institute (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 2020	FY 2021	FY 2022
Title: SEI Applied Research in the Area of Software Engineering, Systems Verification and Validation, and Mission Assurance (formerly Mission Assurance)	5.511	6.023	6.036
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 2021 Plans: • Develop automated design conformance checkers, as part of a continuous integration toolchain. This will aid in correctly identifying significant design non-conformance, advancing DoD capabilities in rapidly composing software systems, including secure AI/ML systems.			
FY 2022 Plans: • Develop new techniques to give Machine Learning (ML) models the ability to express when they are likely to be wrong without drastically increasing the computational burden during training.			
FY 2021 to FY 2022 Increase/Decrease Statement:			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602751D8Z / *Software Engineering Institute (SEI) Applied Research*	**Project (Number/Name)** 278 / *Software Engineering Institute (SEI) Applied Research*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Changes reflect minor budget fluctuations.			
Title: SEI Applied Research in the areas of Information Assurance (IA)	2.158	2.550	2.591
Description: 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. ***FY 2021 Plans:*** • Advance compositional verification techniques to allow the use of unverified commodity software components in DoD systems, including secure and robust AI/ML systems. ***FY 2022 Plans:*** • 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. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Changes reflect minor budget fluctuations.			
Accomplishments/Planned Programs Subtotals	7.669	8.573	8.627

C. Other Program Funding Summary ($ in Millions)

N/A

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 2022 Office of the Secretary Of Defense					Date: May 2021							
Appropriation/Budget Activity 0400 / 2					R-1 Program Element (Number/Name) PE 0602751D8Z / *Software Engineering Institute (SEI) Applied Research*				Project (Number/Name) 817 / *Cyber Security, Applied Research*			
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
817: *Cyber Security, Applied Research*	-	1.563	0.994	0.974	-	0.974	-	-	-	-	-	-

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 2020	FY 2021	FY 2022
Title: Cyber Security	1.563	0.994	0.974
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. ***FY 2021 Plans:*** • 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. • Apply and advance new techniques to continuously assess the operating boundaries for AI/ML algorithms to assure and verify trustworthiness. ***FY 2022 Plans:*** • Improve emulation and virtualization techniques to advance understanding of – and defense capabilities against – adversary attacks. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Changes reflect minor budget fluctuations.			
Accomplishments/Planned Programs Subtotals	1.563	0.994	0.974

C. Other Program Funding Summary ($ in Millions)

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602751D8Z / *Software Engineering Institute (SEI) Applied Research*	**Project (Number/Name)** 817 / *Cyber Security, Applied Research*

C. Other Program Funding Summary ($ in Millions)

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 2: *Applied Research*	**R-1 Program Element (Number/Name)** PE 0602890D8Z / *High Energy Laser Development*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	-	0.000	0.000	45.997	-	45.997	-	-	-	-	-	-
890: *High Energy Laser Development*	-	0.000	0.000	45.997	-	45.997	-	-	-	-	-	-

Note

In FY 2022, High Energy Laser Research Initiatives (including funding) will be transferred from Air Force Program Element (PE) 0602890F to the Office of the Secretary of Defense (OSD) under PE 0602890D8Z for management and execution responsibility to better align this research area to Department of Defense Science and Technology (S&T) strategy and priorities for Directed Energy. This Program will focus on Applied Research for Directed Energy (DE) technologies divided into the following areas: (1) DE Sources; (2) Beam Control; (3) Lethality and Vulnerability; and (4) Power and Thermal Management to reflect the OSD S&T priorities for Directed Energy. This is not a new start PE; efforts are follow-on from Air Force Program Element (PE) 0602890F.

A. Mission Description and Budget Item Justification

This program funds Department of Defense Directed Energy applied research through the Joint Directed Energy Transition Office. This program is part of an overall Department of Defense Directed Energy Science and Technology program. Directed Energy weapon systems have many potential advantages including speed-of-light delivery, low collateral damage, significant magazine depth, and low incremental cost per kill. Directed Energy weapon systems have the potential to perform a wide variety of military missions, including high value asset and base protection, precision strike and platform self-protection versus a wide variety of missile, rocket, artillery, mortar and air platforms. Efforts under this program are generally chosen for their potential to have an impact on multiple Directed Energy weapon systems and multiple Service missions while complementing Service/Agency efforts that are directed at specific Service needs. A broad range of technologies are addressed in key areas, such as laser sources, microwave sources, laser beam control, antennas, waveguides, modeling and simulation, and lethality mechanisms. This program provides the enabling technology necessary to demonstrate advanced concepts for high power microwave (HPM) sources, antennas and waveguides for mission areas not considered to date. The high power microwave lethality, hardware and software improvements and modeling and simulation advances provided by this program are essential to expand and build upon current architectures. This program supports the Senior Official as required. Efforts in this program have been coordinated through the Department of Defense Science and Technology Executive Committee process to harmonize efforts and eliminate duplication.

This program is in Budget Activity 2, Applied Research because this budget activity includes studies, investigations, and non-system specific technology efforts directed toward general military needs with a view toward developing and evaluating the feasibility and practicality of proposed solutions and determining their parameters.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 2: *Applied Research*	**R-1 Program Element (Number/Name)** PE 0602890D8Z / *High Energy Laser Development*

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	0.000	0.000	-	0.000
Current President's Budget	0.000	0.000	45.997	-	45.997
Total Adjustments	0.000	0.000	45.997	-	45.997
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Program Adjustment	-	-	45.997	-	45.997

Change Summary Explanation

In FY 2022, High Energy Laser Research Initiatives transferred from Air Force Program Element (PE) 0602890F to the Office of the Secretary of Defense (OSD) under PE 0602890D8Z for management and execution responsibility to better align this research area to OSD priorities.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 2	R-1 Program Element (Number/Name) PE 0602890D8Z / *High Energy Laser Development*	Project (Number/Name) 890 / *High Energy Laser Development*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
890: *High Energy Laser Development*	-	0.000	0.000	45.997	-	45.997	-	-	-	-	-	-

Note

In FY 2022, High Energy Laser Research Initiatives (including funding) will be transferred from Air Force Program Element (PE) 0602890F to the Office of the Secretary of Defense (OSD) under PE 0602890D8Z for management and execution responsibility to better align this research area to Department of Defense Science and Technology (S&T) strategy and priorities for Directed Energy. Additionally, this Program will focus on Applied Research for Directed Energy (DE) technologies divided into the following areas: (1) DE Sources; (2) Beam Control; (3) Lethality and Vulnerability; and (4) Power and Thermal Management to reflect the OSD S&T priorities for Directed Energy. This is not a new start PE; efforts are follow-on from Air Force Program Element (PE) 0602890F.

A. Mission Description and Budget Item Justification

This program funds Department of Defense Directed Energy applied research through the Joint Directed Energy Transition Office. This program is part of an overall Department of Defense Directed Energy Science and Technology program. Directed Energy weapon systems have many potential advantages, including speed-of-light delivery, low collateral damage, significant magazine depth, and low incremental cost per kill. Directed Energy weapon systems have the potential to perform a wide variety of military missions, including high value asset and base protection, precision strike and platform self-protection versus a wide variety of missile, rocket, artillery, mortar and air platforms. Efforts under this program are generally chosen for their potential to have an impact on multiple Directed Energy weapon systems and multiple Service missions while complementing Service/Agency efforts that are directed at specific Service needs. A broad range of technologies are addressed in key areas, such as laser sources, microwave sources, laser beam control, antennas, waveguides, modeling and simulation, and lethality mechanisms. This program provides the enabling technology necessary to demonstrate advanced concepts for high power microwave sources, antennas and waveguides for mission areas not considered to date. The high power microwave lethality, hardware and software improvements and modeling and simulation advances provided by this program are essential to expand and build upon current architectures. This program supports the Senior Official as required. Efforts in this program have been coordinated through the Department of Defense Science and Technology Executive Committee process to harmonize efforts and eliminate duplication.

This program is in Budget Activity 2, Applied Research because this budget activity includes studies, investigations, and non-system specific technology efforts directed toward general military needs with a view toward developing and evaluating the feasibility and practicality of proposed solutions and determining their parameters.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Directed Energy Sources	-	-	12.077
Description: Mature technologies that will provide system level performance commensurate with fieldable directed energy devices.			
FY 2022 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602890D8Z / *High Energy Laser Development*	**Project (Number/Name)** 890 / *High Energy Laser Development*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Develop high-reliability, lower-cost, efficient, and high-temperature diode pump sources. Scale alternate laser wavelengths to additional militarily relevant uses and power levels. Investigate next generation high power fiber technologies. Reduce technical risk in solid state lasers for inclusion in future laser weapon systems. Conduct trade space analyses to understand performance, fielding, robustness and integration issues for military platforms. Investigate, analyze trade space, and reduce technical risk for high power microwave devices. Conduct analyses and trades studies to determine the most effective microwave source parameters. Explore advanced concepts for technologies that will improve efficiency and decrease size and weight for future Directed Energy (DE) weapon sources. Evaluate materials for high energy laser and high power microwave weapons applications. Improve understanding of laser technologies to include material interaction and propagation. Scale electrically pumped lasers to higher kilowatt-class power levels. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** In FY 2022, Program Element and funding transferred from Air Force Program Element (PE) 0602890F to the Office of the Secretary of Defense (OSD) .			
Title: Beam Control and Propagation	-	-	27.512
Description: Develop technologies that support improving beam control and beam propagation for DE weapon systems. ***FY 2022 Plans:*** Develop beam control technologies for high energy laser weapon use across all domains of the Department. Develop technologies to improve the beam director throughput efficiency, optimize size and weight, and improve tracking and compensation through the atmosphere. Characterize and understand the physics of high energy laser atmospheric propagation in adverse environmental conditions such as fog, rain, smoke and dust. Collaborate with the international directed energy community on progress in the development and application of high energy laser technologies for military missions. Validate predictive models through analysis of atmospheric propagation data and measurements. Provide maintenance, verification, validation, and accreditation for updated system level atmospheric propagation and high energy laser system models. Collaborate with Service-sponsored field-test planning to correlate model predictions with measured data for surface, maritime and aerospace environments. Incorporate atmospheric data into theater models to support performance characterization tables. Continue the development of a predictive avoidance fire control system for use on multiple platforms. Develop kill assessment technologies.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602890D8Z / *High Energy Laser Development*	**Project (Number/Name)** 890 / *High Energy Laser Development*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Develop theoretical physical models describing the propagation of a high power microwave (HPM) pulse through the atmosphere to understand the reflection characteristics of the HPM propagation. Study and understand the dynamic behavior of the propagation of high-power microwave pulses and the effects on the intensity, frequency, and width of the pulse and the physical processes occurring during the interaction of the pulse with the air. Develop kill assessment technologies. Develop hardware and technologies to improve throughput efficiency of the antenna, decrease component weight, and improve tracking and compensation through the atmosphere. Characterize and understand the physics of high power microwave propagation in adverse environmental conditions. Collaborate with the international directed energy community on progress in the development and application of high power directed energy weapon (DEW) technologies for military missions. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** In FY 2022, Program Element and funding transferred from Air Force Program Element (PE) 0602890F to the Office of the Secretary of Defense (OSD) .			
Title: Lethality and Vulnerability ***Description:*** Conduct directed energy vulnerability experiments on materials, components, and targets. Develop a lethality database, and integrate into a systems-level architecture plan and lethality models. ***FY 2022 Plans:*** Integrate lethality and target imagery data into campaign-level high energy laser system models. Conduct high energy laser vulnerability experiments on materials, components, and targets. Develop a suite of high energy laser weapon tools to be used in a database from which the warfighter can assess target vulnerabilities and mission utility for given high energy laser weapon platform and engagement. Develop warfighter tools employing Service and Agencies metrics and criteria such as the Joint Munitions Effectiveness Standards. Develop new predictive modeling software tools to assess the effectiveness of high power microwave (HPM) weapons on electronic systems of interest for blue-on-red or red-on-blue engagements. Evaluate statistical and deterministic cavity coupling algorithms to estimate the temporal and spectral characteristics of the HPM energy coupled into complicated enclosures. Leverage advancements in predictive circuit effects, garnered through several Service and Agency-funded programs, to model and predict the response of complicated electronics to the incident HPM stimulus. Develop warfighter tools employing Service and Agencies metrics and criteria such as the Joint Munitions Effectiveness Standards.	-	-	6.408

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602890D8Z / *High Energy Laser Development*	**Project (Number/Name)** 890 / *High Energy Laser Development*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Collaborate with Service and Agency sponsored High Power microwave survivability / lethality community's interest in, and use of, high power microwave (HPM) engagement models. Continue to provide maintenance, verification, validation, and accreditation for updated system level standalone model that can be used to estimate the probability of electronic upset or damage as a function of the HPM power density on the target and associated range. Develop warfighter tools to determine the power density required on a target to produce a functional kill and understand the required parameters of the HPM, such as power, frequency/ wavelength, modulation, and engagement angle for the kill. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** In FY 2022, Program Element and funding transferred from Air Force Program Element (PE) 0602890F to the Office of the Secretary of Defense (OSD) .			
Title: Power and Thermal Management ***Description:*** Develop technologies for DE power system components including: power generation and storage, power converters, power conditioning, and for DE thermal management systems. ***FY 2022 Plans:*** No plans for this topics area in FY 2022. Developing an investment strategy for future investments. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** In FY 2022, Program Element and funding transferred from Air Force Program Element (PE) 0602890F to the Office of the Secretary of Defense (OSD) .	-	-	0.000
Accomplishments/Planned Programs Subtotals	-	-	45.997

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

NA

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603000D8Z / *Joint Munitions Advanced Technology*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	-	25.399	22.905	23.213	-	23.213	-	-	-	-	-	-
002: *Insensitive Munitions Advanced Technology*	-	18.825	0.000	0.000	-	0.000	-	-	-	-	-	-
301: *Enabling Fuze Advanced Technology*	-	6.574	6.621	0.000	-	0.000	-	-	-	-	-	-
077: *Enhanced Munitions Advanced Technology*	-	0.000	16.284	23.213	-	23.213	-	-	-	-	-	-

Note

New FY 2021 Project Code 077; funding re-aligned from P002 Insensitive Munitions.

This Program Element (PE) aligns with PE 0602000D8Z, 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.
In FY 2022 the JFTP and JEMTP will merge and the program scope will expand to exploit technology developments and accelerate their application to enable next generation kinetic weapons capabilities in the areas of energetic materials, propulsion, warhead effects, fuzing, power sources, guidance, navigation & control, communications and munitions airframe applied technologies.

With the JFTP and JEMTP merge in FY 2022, the P301: Enabling Fuze Advanced Technology line and budget will combine into P077: Enhanced Munitions Advanced Technology.

A. Mission Description and Budget Item Justification

This program advances, demonstrates and transitions joint, pervasive munitions enhancing technologies (warheads, propulsion systems, advanced lethality mechanisms, fuzes and fuze components, and targeting). The goal is to demonstrate joint enabling technologies that increase and improve the performance, lethality, range, reliability, safety, and survivability for existing and inform development of future weapons systems. The program strategically develops and demonstrates advanced munitions technologies that ensure warfighter technical superiority and enable outcomes in the Joint fight. The program technology objectives include: high-speed weapon delivery, longer-range precision effects, networked and collaborative systems of systems, agility at the engagement level, increased capacity/affordable munitions, survivability during deployment and target engagement, and open systems architecture. This program's Joint Munitions Advanced Technologies are vital to guide, coordinate and maximize DoD and Service S&T munitions investments into follow-on system demonstration and integration activities.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603000D8Z / *Joint Munitions Advanced Technology*

The program prioritizes investments from a Joint Service perspective and demonstrates technologies that inform capabilities, thus maximizing efficiencies and ensuring the development of technologies with the broadest applicability to ensure good stewardship of taxpayer dollars. This munitions 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 are comparable to near peer adversaries, and there is an urgent need to provide U.S. warfighters with augmented or new capabilities to ensure technical superiority. The program follows a threat/opportunity analysis to develop kinetic capabilities that enable scenario-based effects from a Joint Fight perspective by exploring technological advances that are beyond Service investment risk acceptance and target asymmetric advantage. The goal is to enable military dominance to ensure effective deterrence of adversary aggression.

The program follows a threat/opportunity analysis to develop kinetic capabilities that enable scenario-based effects from a Joint Fight perspective by exploring technological advances that are beyond Service investment risk acceptance and target asymmetric advantage. The goal is to enable military dominance to ensure effective deterrence of adversary aggression.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	25.779	22.920	23.483	-	23.483
Current President's Budget	25.399	22.905	23.213	-	23.213
Total Adjustments	-0.380	-0.015	-0.270	-	-0.270
• Congressional General Reductions	-	-0.015			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.376	-			
• Program Adjustment	-	-	-0.270	-	-0.270
• Cancelled Account	-0.004	-	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603000D8Z / *Joint Munitions Advanced Technology*	Project (Number/Name) 002 / *Insensitive Munitions Advanced Technology*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
002: *Insensitive Munitions Advanced Technology*	-	18.825	0.000	0.000	-	0.000	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In FY 2021, funds re-aligned to new Project Code (Pcode) 077: Enhanced Munitions Advanced Technology.

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 inform development of 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 relevant environments in the concept and development stages. These demonstrated Enhanced Munitions technologies can then be transitioned, thereby decreasing acquisition program costs and schedule risk. Technologies demonstrated can 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 that guides investments based on goals consistent with the DoD priorities. These 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 Program Executive Offices (PEOs).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Enhanced Munitions Advanced Technology (previously Insensitive Munitions Advanced Technology)	18.825	-	-
Description: Enhanced Munitions Advanced Technology focuses on the following key areas: - High Performance Propulsion - develops technologies to improve weapon range and speed, rocket motors with Ammonium Perchlorate, with or without a metal fuel, for rockets and missiles launched from air, ground, and sea platforms as well as advanced air breathing systems. - 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. - Blast and Fragmentation Warheads (BFW) - focuses on the development and demonstration of technologies that when applied enhance the lethality of Blast/Fragmentation munitions.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603000D8Z / *Joint Munitions Advanced Technology*	**Project (Number/Name)** 002 / *Insensitive Munitions Advanced Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
- Anti-Armor Warheads (AAW) - focuses on the development of explosive ingredients, explosives, and warhead technologies for improving performance of AAW munitions. - 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 2020 Accomplishments - Completed binder reformulation and scale up of a new propellant in a new nozzle system for a large diameter missile system. Demonstrated venting solution for medium sized rocket motor casing applicable to air-to-air missiles. Manufactured motors and conducted baseline testing for a large missile boost motor demonstration. Completed case design and motor geometry for reduced time to target for a surface-to-air system using an advanced composite rocket motor case. - Manufactured components and propellant, for assembly and prep for testing an extruded propellant to improve flight motor for air to ground small missile system. Completed hardware design and manufacture for small diameter rocket motor with minimum signature propellant. - Conducted analysis and optimized the energy management of a small diameter rocket motor system. Designed and began fabrication of components for new rocket motor design. - Conducted modelling and simulation on down-selected formulations and conducted functionality testing on indirect fire munitions to demonstrate improved performance. Conducted preliminary analysis for water pit testing to conduct lethality assessment on novel warhead design for indirect fire ammunition warhead. Began design and analysis for an optimized warhead with fragmentation features using additive manufacturing (AM). Conducted initial scale up preparations of novel warhead initiation booster material. - Conducted modeling and simulation of medium caliber ammunition warhead designs, optimized the design, and started warhead fabrication. - Scaled up and manufactured improved performance explosive, loaded formulations into warheads to conduct basic testing. Procured novel high explosive materials, manufactured samples, and prepared to conduct penetration tests on representative hardware. - Developed a novel ignition system and associated breech assembly for a longer-range gun system that enables a highly efficient ignition of the propelling charge. Developed a novel material cartridge case that enables an increase in efficiency of a gun propulsion system that exhibits the potential to increase projectile muzzle velocity.			
Accomplishments/Planned Programs Subtotals	18.825	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603000D8Z / *Joint Munitions Advanced Technology*	**Project (Number/Name)** 002 / *Insensitive Munitions Advanced Technology*

C. Other Program Funding Summary ($ in Millions)

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603000D8Z / *Joint Munitions Advanced Technology*	Project (Number/Name) 301 / *Enabling Fuze Advanced Technology*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
301: *Enabling Fuze Advanced Technology*	-	6.574	6.621	0.000	-	0.000	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This program will develop and demonstrate advanced fuze technologies needed to develop weapons that address Joint priority capability areas highlighted by the Office of the Under Secretary of Defense for Research and Engineering (OUSD(R&E)) Technology-Focused Modernization and Service Science and Technology (S&T) priorities including High Speed Weapons, Collaborative/Networked Munitions, Counter Unmanned Aerial System (c-UAS) Air Defense and Scalable Lethality. This effort will take promising integrated technologies to maturity and demonstrate capability utilizing weapon hardware derived from priority munitions capabilities and technologies. Demonstrated mature fuze technology will be transitioned, thereby decreasing acquisition 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 high speed 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 2020	FY 2021	FY 2022
Title: Enabling Fuze Advanced Technology	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 high-speed 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 sensing and algorithm solutions to demonstrate smaller, more capable target detection while meeting or exceeding the performance of existing technologies in order to operate in extreme and challenging weapon environments. FY 2020 Accomplishments:			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603000D8Z / *Joint Munitions Advanced Technology*	**Project (Number/Name)** 301 / *Enabling Fuze Advanced Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
- Developed for 3D printed conformal antenna designs and techniques to support Joint applications of Next Generation Proximity Sensor. - Developed and published for use by DoD fuzing weapon developers, Optimal potting guidelines/solutions for High G confined electronics and fuzes. - Developed and released new version of weapon design software that incorporates improved interface models to more accurately simulate and predict fuze to warhead interaction in high shock, extreme environments. ***FY 2021 Plans:*** - 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. - Develop and demonstrate technologies for efficient/novel generation of firing energy for multi-point fuze systems for advanced high-speed weapon warheads. - Develop integrated miniature fuze sensor technology for applications in miniature Unmanned Aerial Vehicle (UAV) weapons. - Demonstrate precision target detection device (TDD) technology for application in miniature Unmanned Aerial Vehicle (UAV) weapons and transition into Services' Counter Unmanned Aerial System (c-UAS) and weaponized Unmanned Aerial System (UAS) programs. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Enabling fuze technology work and resourcing planned for FY 2022 will be transferred to Project Code 077 Enhanced Munitions as a technical area under the Joint Enhanced Munitions Program.			
Accomplishments/Planned Programs Subtotals	6.574	6.621	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603000D8Z / *Joint Munitions Advanced Technology*	Project (Number/Name) 077 / *Enhanced Munitions Advanced Technology*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
077: *Enhanced Munitions Advanced Technology*	-	0.000	16.284	23.213	-	23.213	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

New FY 2021 Project Code; funding re-aligned from P002 Insensitive Munitions.

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 Program Executive Office's (PEO) program costs and schedule risk, facilitating spin-offs to other 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.

Through FY 2021, 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.

In FY 2022, the JFTP and JEMTP will merge and the program scope will expand to exploit technology developments such as hypersonics, machine learning, artificial intelligence, quantum computing, etc. and accelerate their application to enable next generation kinetic weapons capabilities in the areas of energetic materials, advanced propulsion, warhead effects, enabling fuze technologies, and pioneering targeting technologies with a specific focus on enhancing kinetic weapons lethality, range and resultant effects. The program will retain tri-service leadership to inform technology investments accelerating development across the Department. Investments will be informed by a threat-opportunity based analysis that focuses on developing weapons systems that exploit technology dominance to ensure military objectives in Joint Force campaign scenarios. New technology roadmaps for munition technical areas will guide investments consistent with the DoD National Defense Strategy and inform Service technology investments.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Enhanced Munitions Advanced Technology	-	16.284	23.213

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603000D8Z / *Joint Munitions Advanced Technology*	**Project (Number/Name)** 077 / *Enhanced Munitions Advanced Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Description: Enhanced Munitions Advanced Technology focuses on the following key areas: - 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. - 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; rocket motor case design; ignition systems; and thrust mitigation techniques, of minimum signature propellant missiles launched from air, ground, and sea platforms. - Area Effects Warheads (AEW) - focuses on the development and demonstration of technologies that enhance the lethality, and reduce the size and weight of Area Effects munitions. - Hard Target Effects Warheads (HTEW) - focuses on the development and demonstration of explosive ingredients, explosives, and warhead technologies to improve the performance and lethality of HTEW munitions. - 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 tank/mortar and medium/large caliber propulsion systems, as well as shoulder launched weapon systems. ***FY 2021 Plans:*** - Complete fabrication and static fire testing on half scale improved missile boost motor demonstrator. Complete motor design, component fabrication, and load and burst design testing for air defense system. - Manufacture preliminary designs for missile motor and case assemblies to support an extended range air to ground small motor testing. - Complete hardware design and fabrication of improved ground to ground flight motor. Complete designs, fabricate hardware, and conduct testing of a small diameter rocket motor system. - Conduct modeling and simulation, formulation and set back testing on large diameter indirect fire munitions to demonstrate improved performance while maintaining safety response. Optimize and finalize the design of an AM warhead and prepare to conduct lethality testing to compare to the existing baseline warhead. Complete initial unique warhead design, manufacture test assets, and conduct arena tests to determine improved lethality. - Build and conduct water-pit testing of medium caliber ammunition warheads with improved lethality on full cartridges. Conduct characterization and performance testing on improved performance explosive material for HTEWs. Conduct initial penetration testing using novel high explosive material loaded hardware and down-select design for improved penetrator.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603000D8Z / *Joint Munitions Advanced Technology*	**Project (Number/Name)** 077 / *Enhanced Munitions Advanced Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
- Scale up and manufactured at the 5 pound batch a novel improved gun propellant formulation in order to fully characterize material, and conduct performance and test firing in medium caliber gun cartridges. Manufacture extended range propellant for indirect fire weapon system at the 2-gallon scale and complete characterization studies to prepare for scale-up. ***FY 2022 Plans:*** - Complete advanced performance testing on half scale improved missile boost motor demonstrator. Conduct motor preparations and static motor firing for air defense system. - Complete testing and down-selection on preliminary designs for missile motor and case assemblies to support an extended range air to ground missile system, and begin final motor manufacturing. Conduct ground and prepare for flight testing of improved ground to ground flight motor. - Complete final design and static testing of a small diameter rocket motor system. - Conduct down-selection of formulation and lethality testing on large diameter indirect fire munitions to demonstrate improved performance. Finalize unique warhead design, manufacture test assets, conduct set-back testing, and prepare assets for arena tests to determine improved lethality. - Conduct final design testing in multi-warhead configuration using novel high explosive material loaded hardware for improved performance. - Scale up a novel improved propellant formulation and conduct performance testing. Scale-up extended range propellant for indirect fire weapon system and conduct initial full-scale weapon tests. - Demonstrate Micro-Electro Mechanical System (MEMs) based sensor/micro valve that enables low cost Safe and Arm devices. - Demonstrate high energy density, thin film battery with thin film heat source for broad applications including artillery, missiles, and miniature munitions. - Develop and demonstrate robust and survivable target sensor solution for high-speed weapons that react in relevant timescales. - Develop high-speed weapon survivable and quick triggering high voltage Electronics Safe and Arm Devices (ESADs) components. - Develop advanced sub-scale testing method and apparatus to rapidly evaluate survivability of fuzing components in high shock, extreme environments. - Develop new multi-mode ultrafast targeting algorithms exploiting advancements in microelectronics and materials. - Demonstrate technologies facilitating weapons communication and networking impacting guidance, target detection, and weapons effectiveness. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** New FY 2021 Project Code; funding re-aligned from P002 Insensitive Munitions.			
Accomplishments/Planned Programs Subtotals	-	16.284	23.213

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603000D8Z / *Joint Munitions Advanced Technology*	**Project (Number/Name)** 077 / *Enhanced Munitions Advanced Technology*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

THIS PAGE INTENTIONALLY LEFT BLANK

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603121D8Z / *SO/LIC Advanced Development*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	0.000	4.847	4.904	4.665	-	4.665	-	-	-	-	-	-
121: *SO/LIC Advanced Development*	0.000	4.847	4.904	4.665	-	4.665	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Secure, Unclassified Network (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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	5.000	4.914	5.047	-	5.047
Current President's Budget	4.847	4.904	4.665	-	4.665
Total Adjustments	-0.153	-0.010	-0.382	-	-0.382
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-0.010			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Program Adjustment	-0.153	-	-0.382	-	-0.382

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Secure, Unclassified Network (SUNet)	4.847	4.904	4.665

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603121D8Z / *SO/LIC Advanced Development*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
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. ***FY 2021 Plans:*** Expand the Competitive Space. Continue efforts 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, policy support, system redundancy and failover to efficiently and effectively support a growing number of users and missions across the platform. ***FY 2022 Plans:*** Expand the Competitive Space. Continue efforts 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, policy support, system redundancy and failover to efficiently and effectively support a growing number of users and missions across the platform. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Minor program adjustments.			
Accomplishments/Planned Programs Subtotals	4.847	4.904	4.665

D. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603121D8Z *I SO/LIC Advanced Development*

E. Acquisition Strategy

N/A

THIS PAGE INTENTIONALLY LEFT BLANK

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603122D8Z / *Combating Terrorism Technology Support*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	957.160	113.445	144.847	69.376	-	69.376	-	-	-	-	-	-
484: *Combating Terrorism Technology Support (CTTS)*	957.160	113.445	144.847	69.376	-	69.376	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

At the direction of the former Acting Secretary of Defense, the Combating Terrorism Technical Support Office (CTTS program) remains in the Office of the Assistant Secretary of Defense for Special Operations and Low Intensity Conflict (OASD SO/LIC), but was transitioned to be the Irregular Warfare Technical Support Directorate (IWTSD). The FY 2020 NDAA directed an independent study by the Center for Naval Analyses that stated the optimum location for IWTSD (formerly CTTSO) was to remain in the OASD SO/LIC and that CTTSO fulfills a unique niche in DOD's research and development landscape, meeting needs other organizations do not. During the transition, IWTSD reviewed the subgroup focus areas and some of the subgroups were renamed.

IWTSD supports the National Defense Strategy (NDS), the Irregular Warfare Annex, and will give those identified peer-to-peer high interest areas increased priority. IWTSD also recognizes that many of the existing requirements already supports many of the 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; novel body and vehicle armor; detecting, protecting against, and mitigating novel and wartime chemical threats; telematics; covert communications; and of special interest, the use of machine learning and artificial intelligence to enhance the capability of systems used by the military and lesson the workload on the individual users.

IWTSD will continue to focus its R&D activities to rapidly fill the immediate and critical capability gaps of military operators, intelligence analysts, and first responders that are at the leading edge of the fight or response. The FY21 Congressionally directed and funded cooperative 50-50 cost sharing of RDT&E projects with Israel to address countering small unmanned aerial vehicles and enhance detection of and operations in tunnels will continue in FY22 or until the funds are expended. Although COVID 19 has greatly impacted the nation, IWTSD was able to immediately transition to a telework environment and continue to collaborate and coordinate with users and industry using the virtual environment. While not optimum, this capability allowed IWTSD to continue to fill our user's capability gaps and help keep small businesses operating.

From a broader perspective, projects remain distributed among ten 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. Each of these programs have long held and strong partnerships with the components of USSOCOM, the Services; and a large number of Defense Agencies.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603122D8Z / *Combating Terrorism Technology Support*

While supporting the NDS, the IWTSD 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. IWTSD 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. IWTSD is unique in its approach, annually obtaining joint requirements directly from military and law enforcement operators, intelligence analyst, and first responders and discussing those requirements with industry even before released in a Broad Area Announcement (BAA).

The IWTSD 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 peer or near-peer forces, emerging threats, and combating terrorism requirements. This includes rapid technology capability development, testing products, proof-of-concept demonstrations in field applications, operational test and evaluations of prototypes, and coordinating the transition from development to operational use.

For FY 2022, the time from requirements to contracts has been shortened in order to provide solutions even more rapidly to the users and to ensure IWTSD is addressing the most near-term needs. As such, the Program Requirements Meetings with users will not occur until January, 2021 and contracts awards beginning by October or November 2021 (the start of FY 2022). IWTSD normally manages approximately 220 individual projects; while also reviewing proposals and negotiating contracts for another 70 requirements prior to the next fiscal year.

The IWTSD program identifies the projects fully or partially funded by Congressional appropriations for the IWTSD program. However, IWTSD 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 IWTSD has earned throughout the Department of Defense and interagency to rapidly conduct critical RDT&E and provide innovative products. The available funding and number of requirements from users that IWTSD needs to address in FY 2022 has been reduced by 33% in accordance with the Defense Wide Review. Due to the Defense Wide Review budget reductions, IWTSD will ask Defense and Interagency partners to increase their funding contributions to help IWTSD address and fill their critical capability gaps.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	113.445	70.377	72.317	-	72.317
Current President's Budget	113.445	144.847	69.376	-	69.376
Total Adjustments	0.000	74.470	-2.941	-	-2.941
• Congressional General Reductions	-	-0.030			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	74.500			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Program Adjustment	-	-	-2.941	-	-2.941

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603122D8Z / *Combating Terrorism Technology Support*

Change Summary Explanation

FY 2022 reductions made to support higher priority requirements.

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Advanced Analytic Capabilities (AAC)	6.037	11.247	5.046

Description: The Advanced Analytics (AA) 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 2021 Plans:

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.

Expand the Competitive Space. 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 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 drone based analytics for in-field mission planning support. 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. Initiate and complete development and operationalization of a computer vision algorithm in order to provide a capability to tag and track objects in a region of interest, training its algorithms on classified Full Motion Video (FMV) to increase accuracy and enhance its tracking capabilities in an operational environment.

Sustain Combating Terrorism. Continue 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.

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. Initiate development of concepts for modernization of military radio frequency deception techniques using current technology focused on Publicly Available Information (PAI), (e.g., Social

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603122D8Z / *Combating Terrorism Technology Support*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Media, Blogs, and URLs of Interest). Initiate development, testing, and evaluation of a vision-based machine-learning algorithm capable of capturing civil information and populating standardized survey questions in Esri Survey123 forms. ***FY 2022 Plans:*** Expand the Competitive Space. Complete drone based analytics for in-field mission planning support. Complete 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. 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. Irregular Warfare as a Core Competency. Complete development of concepts for modernization of military radio frequency deception techniques using current technology focused on Publicly Available Information (PAI), (e.g., Social Media, Blogs, and URLs of Interest). Complete development, testing, and evaluation of a vision-based machine-learning algorithm capable of capturing civil information and populating standardized survey questions in Esri Survey123 forms. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Congressional adjustment made in FY 2021.			
Title: CHEMICAL, BIOLOGICAL, RADIOLOGICAL, NUCLEAR, AND EXPLOSIVES (CBRNE)	9.510	16.968	7.863
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. ***FY 2021 Plans:*** Enhance Survivability for Close Combat Formations. Complete the development of a solution that effectively decontaminates chemical and biological (CB) warfare agents on skin and wounds. 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 toxic industrial chemicals (TICs) and chemical warfare agents (CWAs) vapors. Complete development of a wearable solution that autonomously monitors, detects, and captures biological threat agents for identification. Initiate a self-contained, single use assay for the detection of synthetic opioids that will enable field-forward personnel to quickly and accurately test for fentanyl while			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603122D8Z / *Combating Terrorism Technology Support*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
minimizing the handling hazards. Initiate development of a ruggedized, handheld system for rapid detection and identification of biological agents without requiring sample preparation or buffer solutions from users. 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. 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 new Universal Suit-Seal Interface to accommodate a broader range of masks and personal protective ensembles. Complete the development of a containment system for rapidly encapsulating and transporting objects contaminated with CB hazards, such as CWAs and TICs. Complete the assessment of National Institute for Occupational Safety and Health (NIOSH) certified CBRN respirator filter canisters when stored unpackaged and pre-affixed to respirators. Complete improving the ability to detect and characterize 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. Continue the development of a practical application of Surface Enhanced Spatially Offset Raman Spectroscopy (SESORS) for trace threat detection. Continue the development of a respiratory protective device designed for canines that can fit the general working dog population. Continue 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. Continue optimizing the methodology for using Alternative Light Sources (ALS) systems to visualize and screen for pharmaceutical-based agent (PBA) threats. Continue to identify new and/or novel uses of existing technologies that can be used to rapidly degrade or destroy chemical munitions (CM) in a non- or semi-permissive environment through execution of an industry challenge. Continue identifying successful operational guidance for decontaminating fentanyl and its analogs. Continue development of a risk-based decision support model for skin decontamination in the case of dermal exposures to CWAs. Continue the redesign of the current vacuum sampling devices to accommodate collection of liquid samples for chemical or microbiological forensic analysis. Continue development of a man-portable system that can reliably detect explosives through continuous gas phase monitoring. Initiate development of a pocket sized Raman system capable of identifying unknown dark/colored materials, in addition to current detectable threats through non-metallic barriers. Initiate development of chemical detection tape that will classify both liquids and aerosols as G series, Blister, or V series agents. Initiate development of chemical/biological protective cover for a self-contained breathing apparatus (SCBA) and SCBA components. Initiate the development of a screening system capable of simultaneously screening passengers and bags carried by passengers for mass casualty weapons. Initiate development of a low-cost, tactical handheld Raman system capable of identifying explosives, TICs/toxic industrial materials (TIMs), drugs, and CWAs.			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603122D8Z / *Combating Terrorism Technology Support*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Integrate with the U.S. Interagency. 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 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. Complete updating the current open source CB recipe inventory to include metadata on each discovered recipe and incorporating recipe and precursor information into a threat recognition guide. Complete development of an online database containing feedback on CBRNE detector field performance and test data. Complete to assess improvements to detection performance through use of novel swabs in currently fielded explosive trace detectors. 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 testing and evaluation of a next generation sensors for use in trace, bulk, proximity, and stand-off detection of explosives-based threats. Continue evaluation of enhanced sampling materials and systems for CBRNE threats. 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. Initiate development of an explosive trace detection training tool that provides feedback to users as they practice hands-on trace collection. Strengthen Alliances. Complete development of a commercialized capability to produce aerosolized chemical and biological hazards for threat characterization. Complete improvement of a previous biological detector prototype to enhance performance and detection capabilities. 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 the investigation of the detonation of improvised radiological dispersal devices (RDDs) in an urban environment to gain valuable emergency response and forensic information. 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 to develop, validate, and/or share microbial assays and techniques for attribution of bioterrorist agents. Continue to compare the performance of two Joint Handheld Bio-Agent Identifiers so that informed decisions on future procurement and interoperability can be made. 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. Continue to address emerging improvised CBR threats through international/interagency burden sharing and coordination groups. 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.			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603122D8Z / *Combating Terrorism Technology Support*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Enable U.S. Interagency Counterparts to Advance U.S. Influence and National Security Interests. 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. Continue enhancing mitigation techniques to reduce the impact of threat releases in transportation platforms and confined spaces. Initiate the evaluation of CB sensor systems in highly populated areas, provide data to optimize evacuation and response measures and refine best practices in response to a WMD in a large crowded space.			
FY 2022 Plans: Enhance Survivability for Close Combat Formations. Complete a self-contained, single use assay for the detection of synthetic opioids that will enable field-forward personnel to quickly and accurately test for fentanyl while minimizing the handling hazards. Continue development of a ruggedized, handheld system for rapid detection and identification of biological agents without requiring sample preparation or buffer solutions from users. Sustain CBRNE Units for Defense and the Homeland. Complete the development of a practical application of Surface Enhanced Spatially Offset Raman Spectroscopy (SESORS) for trace threat detection. Complete the development of a respiratory protective device designed for canines that can fit the general working dog population. Complete 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. Complete optimizing the methodology for using Alternative Light Sources (ALS) systems to visualize and screen for pharmaceutical-based agent (PBA) threats. Complete to identify new and/or novel uses of existing technologies that can be used to rapidly degrade or destroy chemical munitions (CM) in a non- or semi-permissive environment through execution of an industry challenge. Complete identifying successful operational guidance for decontaminating fentanyl and its analogs. Complete development of a risk-based decision support model for skin decontamination in the case of dermal exposures to CWAs. Complete the redesign of the current vacuum sampling devices to accommodate collection of liquid samples for chemical or microbiological forensic analysis. Complete development of a man-portable system that can reliably detect explosives through continuous gas phase monitoring. Complete development of a pocket sized Raman system capable of identifying unknown dark/colored materials, in addition to current detectable threats through non-metallic barriers. Complete development of chemical detection tape that will classify both liquids and aerosols as G series, Blister, or V series agents Complete development of chemical/biological protective cover for a self-contained breathing apparatus (SCBA) and SCBA components. Complete development of a low-cost, tactical handheld Raman system capable of identifying explosives, TICs/toxic industrial materials (TIMs), drugs, and CWAs. Continue the development of a screening system capable of simultaneously screening passengers and bags carried by passengers for mass casualty weapons. Initiate the development of an oxygen supply system that will automatically activate in the case of poor air quality. Integrate with the U.S. Interagency. 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			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603122D8Z / *Combating Terrorism Technology Support*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
deployed responder networks. Complete development of an explosive trace detection training tool that provides feedback to users as they practice hands-on trace collection. 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 testing and evaluation of a next generation sensors for use in trace, bulk, proximity, and stand-off detection of explosives-based threats. Continue evaluation of enhanced sampling materials and systems for CBRNE threats. Strengthen Alliances. Complete the investigation of the detonation of improvised radiological dispersal devices (RDDs) in an urban environment to gain valuable emergency response and forensic information. 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 to develop, validate, and/or share microbial assays and techniques for attribution of bioterrorist agents. Continue to compare the performance of two Joint Handheld Bio-Agent Identifiers so that informed decisions on future procurement and interoperability can be made. Support Relationships to Address Significant Terrorist Threats. Complete 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. Continue to address emerging improvised CBR threats through international/interagency burden sharing and coordination groups. 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. 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. Continue enhancing mitigation techniques to reduce the impact of threat releases in transportation platforms and confined spaces. Continue the evaluation of CB sensor systems in highly populated areas, provide data to optimize evacuation and response measures and refine best practices in response to a WMD in a large crowded space. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Congressional adjustment made in FY 2021.			
Title: Explosive Ordnance Disposal/Explosive Operations (EOD/EXO)	10.252	13.640	5.873
Description: The EOD/EXO Subgroup's objective is to deliver capabilities to defeat or neutralize the continuum of terrorist improvised weapons and explosive devices. EOD/EXO improves the operational capabilities of the bomb disposal and explosive operations community, consisting of military EOD, combat engineers, special operations forces, and federal, state, and local bomb squads, by developing and delivering advanced tools and technologies, and decision support information to defeat improvised			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603122D8Z / *Combating Terrorism Technology Support*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022

terrorist devices. The EOD/EXO Subgroup identifies and prioritizes multi-agency end-user requirements in collaboration with military units, and federal, state, and local agencies. EOD/EXO 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.

FY 2021 Plans:

Sustain Combating Terrorism. Continue technological development, EOD/combat environment-specific ruggedization, and software training efforts for a humanoid robotic platform prototype for IED Defeat operations in urban environments. Continue conducting workshops that integrate Explosive Ordnance Disposal (EOD) and Public Safety Bomb Technicians (PSBT) with engineers and roboticists to collaboratively design and develop new capabilities for counter-IED operations, counter-tunnel operations and VBIED response. Continue development of a full color digital night vision system to aid in IED component identification and diagnostics. Complete development of an electronic UAS Guidebook for rapid identification and analysis of hazards from downed UAS platforms during response operations. Complete development of bomb disposal tools for deployment on, or by, small UAS-based platforms. Complete development of a hands-free bomb suit heads-up display that projects mission and sensor data onto the bomb suit helmet screen. Complete conducting requirement gathering events where bomb technicians evaluate and test current technologies in real world scenarios. Complete development and integration of an infrared camera into a high definition, live-streaming camera that displays images onto a wearable screen and aids in the identification of power supplies and other circuitry under load by differential heat signature. Complete development of library of IED circuits for training, which contains component lists, assembly instructions, and files for making printed circuit boards. Complete development of a remote chemical detection capability for EOD operations that allows identification, analysis, and technical characterization of explosives. Complete development of an artificial intelligence-based neural network that will process imagery captured by operators using high-definition cameras to aid in the location and identification of hazardous device indicators.

Integrate with the U.S. Interagency. Complete 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 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. Complete development of a rapidly mountable backscatter X-ray system for small to medium sized robotic platforms. Complete research to produce customizable energetic tools to disrupt explosive devices in high risk environments. Initiate development a luminous and infrared marking spray and dispenser for tactical marking during urban and subterranean combat operations. Initiate development of large, labeled, robust, and realistic IED and IED component dataset for training future machine learning and artificial intelligence-based C-IED projects. Initiate development of a software program that will synthetically generate high quality images of IEDs and IED

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603122D8Z / *Combating Terrorism Technology Support*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
components to significantly reduce the cost burden of collecting threat device imagery datasets for future machine learning efforts and IED recognition applications. Initiate development of a comprehensive and shareable dataset that will include multi-angle photographs and x-ray images of microcontrollers and microsensors to augment future development of artificial intelligence-based IED threat recognition software. Strengthen Alliances. Continue bilateral information exchange between U.S.-based bomb technicians and members of the Israel National Police Bomb Disposal Division. Continue a bilateral effort with Australia DOD to evaluate, participate in, and influence future investment in countering improvised threat (CIT) technology to avoid duplication of effort and better direct resources for the integration of CIT sensor and effector technologies. ***FY 2022 Plans:*** Sustain Combating Terrorism. Continue technological development, EOD/combat environment-specific ruggedization, and software training efforts for a humanoid robotic platform prototype for IED Defeat operations in urban environments. 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 counter-IED operations, counter-tunnel operations and VBIED response. Complete development of a full color digital night vision to aid in IED component identification and diagnostics. Integrate with the U.S. Interagency. Complete development a luminous and infrared marking spray and dispenser for tactical marking during urban and subterranean combat operations. Complete development of large, labeled, robust, and realistic IED and IED component dataset for training future machine learning and artificial intelligence-based C-IED projects. Complete development of a software program that will synthetically generate high quality images of IEDs and IED components to significantly reduce the cost burden of collecting threat device imagery datasets for future machine learning efforts and IED recognition applications. Complete development of a comprehensive and shareable dataset that will include multi-angle photographs and x-ray images of microcontrollers and microsensors to augment future development of artificial intelligence-based IED threat recognition software. Strengthen Alliances. Continue bilateral information exchange between U.S.-based bomb technicians and members of the Israel National Police Bomb Disposal Division. Continue a bilateral effort with Australia DOD to evaluate, participate in, and influence future investment in countering improvised threat (CIT) technology to avoid duplication of effort and better direct resources for the integration of CIT sensor and effector technologies. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Congressional adjustment made in FY 2021.			
Title: FORENSIC Exploitation and Identity Operations (FEIO)	11.312	13.316	6.224

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603122D8Z / *Combating Terrorism Technology Support*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Description: The FEIO subgroup's objective is to advance combating terrorism capabilities in investigative and forensic science. FEIO 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. ***FY 2021 Plans:*** Sustain Combating Terrorism: Complete the development and fielding of an automatic video file search and analysis tool for any user defined object to collect evidence and intelligence. Complete the development of new forensic procedures to collect and analyze simultaneous 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 and fielding of a system that analyzes audio recordings to find and classify sounds and 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 a rugged, mobile, forensic alternative light source for better visualization and photographing of trace evidence. Complete development of an automated process to enhance the clarity, detail, and pixel level of low resolution images. Complete the development 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. Initiate development of a software application that evaluates data from a polygraph exam to determine if any countermeasures were used by the interviewee. Initiate development of a set of techniques for evidence disclosure during investigative interviews to optimize the acquisition of credible information from the interviewee. Initiate development of polygraph sensors that are minimal or non-contact with the body and acquire physiological measurements for credibility assessment. Initiate development of a software development kit that is			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603122D8Z / *Combating Terrorism Technology Support*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
compatible with all known USG biometric file types and supports multiple programing languages for biometric records to ensure interoperability and data sharing across federal agencies. ***FY 2022 Plans:*** Sustain Combating Terrorism: Complete development and fielding of an electro-optical and infrared (EO/IR) handheld prototype system for human identification and scene analysis and for day and nighttime collection of facial imagery and objects. Complete development and fielding of a flat-bed LASER light scanning system that captures pre- and post-processed latent prints and can be used in laboratory and field environments. Complete development and fielding of a software application that evaluates data from a polygraph exam to determine if any countermeasures were used by the interviewee. Complete the development and fielding of a set of techniques for evidence disclosure during investigative interviews to optimize the acquisition of credible information from the interviewee. Complete development and fielding of polygraph sensors that are minimal or non-contact with the body and acquire physiological measurements for credibility assessment. Complete development and fielding of a gait recognition software system capable of matching and identifying gait/walking signatures in video files regardless of camera angles. Complete the development and fielding of a software development kit that is compatible with all known USG biometric file types and supports multiple programing languages for biometric records to ensure interoperability and data sharing across federal agencies. Initiate the research, development, and production of a field handbook to guide law enforcement and forensic personnel to optimize exploitation of incident scenes. Initiate development of a multi-purpose dye that can sprayed at incident scenes to visual latent prints and touch DNA. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Congressional adjustment made in FY 2021.			
Title: Indirect Influence and Competition (I2C) ***Description:*** The I2C 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, I2C 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. ***FY 2021 Plans:*** Expand the Competitive Space. Complete a 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. Complete an effort to explore the emerging blockchain technologies and the risks and opportunities posed by them with respect to United States	9.090	13.741	6.082

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603122D8Z / *Combating Terrorism Technology Support*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
national security interests to improve US Government understanding of the Encrypted Ledger and expand options for emerging fronts in 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 development of a capability that can deploy, through air drop, large quantities of containers with payloads 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. Create the Geppetto tool to automate rapid detection of deep fakes. 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 validation of the puppet-and-driver Deep Fakes effort to validate the benchmarked algorithm performance so agencies can make independent decisions on how to best implement the Geppetto tool. Initiate Synthetic Text Detection to equip non-technical experts with an application, tool, plug-in, or other similar technical solution that can be standalone, updateable, and capable of identifying synthetically generated text, even after it may have been edited or further enhanced by humans. If successful, this project would represent an extreme enhancement over current human (manual) analysis. Integrate with the US Interagency. 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 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. 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. Continue 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			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603122D8Z / *Combating Terrorism Technology Support*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
capabilities that can be procured on the local economy of the country of interest. Initiate the SOF Enabled Cyber Toolkit to provide SOF an enterprise-level ability to provide "last mile" cyber-enabled activities in order to bridge the gap between tactical and higher echelons of cyber capability. Strengthen Alliances. Complete efforts with the United Kingdom's Defense Science and Technology Laboratory to sponsor field research in Estonia 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. Continue 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 alliances and expanding the competitive space to confront terrorist and other threats in the information environment. 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 2022 Plans: Expand the Competitive Space. Continue Synthetic Text Detection to equip non-technical experts with an application, tool, plug-in, or other similar technical solution that can be standalone, updateable, and capable of identifying synthetically generated text, even after it may have been edited or further enhanced by humans. If successful, this project would represent an extreme enhancement over current human (manual) analysis. Irregular Warfare as a Core Competency. Continue 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			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603122D8Z / *Combating Terrorism Technology Support*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
that can be procured on the local economy of the country of interest. Continue the SOF Enabled Cyber Toolkit to provide SOF an enterprise-level ability to provide "last mile" cyber-enabled activities in order to bridge the gap between tactical and higher echelons of cyber capability. 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 alliances and expanding the competitive space to confront terrorist and other threats in the information environment. Sustain Combating Terrorism. Complete 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 to FY 2022 Increase/Decrease Statement:*** Congressional adjustment made in FY 2021.			
Title: Protection, Survivability, and Recovery (PSR) ***Description:*** The Protection, Survivability, and Recovery 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. ***FY 2021 Plans:*** Enhance Survivability for Close Combat Formations. Complete the investigation of the root causes of poor armor fit among U.S law enforcement agencies and identify corrective actions and standard procedures to ensure proper fit to body armor users across the anthropometric spectrum of law enforcement professionals. Complete development of biomarker identification for brain injury using magnetic resonance imaging (MRI) and magnetic resonance spectroscopy (MRS) to monitor neurochemical biomarkers	17.165	17.516	8.538

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603122D8Z / *Combating Terrorism Technology Support*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
for post-traumatic stress disorder and mild traumatic brain injury. 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 multi-modal system to detect, identify and mitigate unmanned aerial threats to tactical vehicles and other mobile platforms in terrestrial and maritime environments. Complete development of a system capable of UAS detection, geolocation, tracking and disruption for the protection of dismounted soldiers and operators. Complete development of a multi-threat helmet to provide impact, ballistic and blast protection for law enforcement officers. 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 vehicle mounted, tethered aerial platform capable of carrying a wide variety of payloads to fill various mission needs. 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 development of innovative materials for use in advanced armor systems. Continue development of advanced ceramic materials with enhanced mechanical properties for use in novel armor applications. Continue development of a two dimensional polymer material with superior strength to weight ratio for large scale synthesis and use in lightweight armor applications. Initiate development of a standard 7.62 x 39mm projectile test surrogate to provide a standard test round for body armor test protocols. Initiate development of a standardized transparent armor for non-tactical armored vehicles with a ~30% reduction in weight and thickness while achieving a threshold ballistic rating of VPAM VR9. Continue development of a skin applique for ballistic protection of the extremities from blast propelled fragmentation and debris. Initiate development of an eye protection system in the form of a face shield or glasses that provides the operator protection from frequencies of laser light while allowing enough visible light for the operator to see. Initiate development of a spectacle lens capable of achieving goggle ballistic requirements while maintaining current spectacle form factor and weight. 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. 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. Initiate development of a tracking device that will work in disadvantaged/denied GPS environments with no additional equipment (e.g., geo-located tags, repeaters, signal boosters). Complete development of a discrete, self-adhesive patch that provides silent, tactile stimulation to provide personnel with emergency notifications. Continue test and evaluation of two C-UAS radar systems and of a capture/carry UAS. Continue integration of two RF detection system into kinetic C-UAS system. Continue development of a multi-mission UAS that could perform C-IED and C-UAS missions on top of ISR missions. Initiate development of an advanced optical detection system to detect small UAS. Initiate development of a radar system to detect small UAS in urban environments. Initiate development of a capture/carry C-UAS system.			
FY 2022 Plans:			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603122D8Z / *Combating Terrorism Technology Support*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Enhance Survivability for Close Combat Formations. Complete development of a two dimensional polymer material with superior strength to weight ratio for large scale synthesis and use in lightweight armor applications. Complete development of advanced ceramic materials with enhanced mechanical properties for use in novel armor applications. Complete development of innovative materials for use in advanced armor systems. Complete development of a standard 7.62 x 39mm projectile test surrogate to provide a standard test round for body armor test protocols. Complete development of a man packable system that reduces or eliminates the radar, electronic, thermal, infrared, visual or acoustic signatures of a dismounted soldier. Complete development of a spectacle lens capable of achieving goggle ballistic requirements while maintaining current spectacle form factor and weight. Continue development of an eye protection system in the form of a face shield or glasses that provides the operator protection from frequencies of laser light while allowing enough visible light for the operator to see. Initiate development of advanced materials for use in vehicle armor systems for all federal government. Initiate development to increase ballistic protection and reduce weight for body armor. Continue development of a standardized transparent armor for non-tactical armored vehicles with a ~30% reduction in weight and thickness while achieving a threshold ballistic rating of VPAM VR9. Complete development of a skin applique for ballistic protection of the extremities from blast propelled fragmentation and debris. Integrate with the U.S. Interagency. Complete development of a tracking device that will work in disadvantaged/denied GPS environments with no additional equipment (e.g., geo-located tags, repeaters, signal boosters). Initiate development of an increased situational awareness system for law enforcement and military applications. Complete test and evaluation of two C-UAS radar systems and of a capture/carry UAS. Complete development of an advanced optical detection system to detect small UAS. Complete development of a capture/carry C-UAS system. Complete development of a multi-mission UAS that could perform C-IED and C-UAS missions on top of ISR missions. Continue development of a radar system to detect small UAS in urban environments. Continue integration of two RF detection system into kinetic C-UAS system. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Congressional adjustment made in FY 2021.			
Title: Expeditionary Force Protection (EFP) ***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 for expeditionary advance based operations, forward operating bases, along the U.S. borders, mass transportation and commerce nodes, in maritime port and littoral environments, U.S. embassies and consulates, and in support of large-scale public venues. ***FY 2021 Plans:*** FY2021 Plans:	7.955	11.926	6.767

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603122D8Z / *Combating Terrorism Technology Support*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
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. 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. Continue the development and testing of a series of scaled tests on various types of masonry constructions subjected to blast loading. Continue development of algorithms using machine learning for the detection of threats in Computed Tomography (CT) and x-ray screening systems. 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 and testing of a less-than-lethal-weapon (LLW) prototype that 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. Continue 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 test and evaluation of Ethylene-vinyl Acetate (EVA) laminated glass to determine its blast protection performance as compared to Polyvinyl Butyral (PVB) laminated glass. Continue 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. Strengthen Alliances. Complete development of a comprehensive database of COTS systems for pre-detonation and protection against direct impact munitions. Complete integration of Human Injury Prediction (HIP) for Vulnerability Assessment and Protection Option (VAPO) 7 to effectively and accurately model the effects of an explosive event. These effects include air blast propagation, fragmentation effects and patterns, human injury models, etc. Complete testing and deliver a vehicle pre-breaching system, which is designed to provide additional physical security to operators and passengers during breaching operations. Complete testing, assessment, evaluation, and training on emerging explosive threat models for personnel, vital equipment, and facilities protection against VBIED attacks. Continue development of an advanced active diver thermal protection system for long exposure dives, including SEAL Delivery Vehicle (SDV) operations. Continue test and evaluation of an interoperable, detect-to-defeat capability to provide waterside security (ports and harbors) and against underwater littoral threats. Continue leveraging assets and capabilities in the area of HME materials characterization to support research efforts. Continue hosting bi-annual data exchange with foreign partners to leverage assets and capabilities to support each country's research efforts in the area of maritime security. Continue hosting bi-annual data exchange with foreign partners to exchange research/info on physical protection of facilities, to include but not limited to: entry control points, vehicle barriers, blast/forced entry mitigation, and sensitive material destruction.			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603122D8Z / *Combating Terrorism Technology Support*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Sustain Combating Terrorism. 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. Continue the development and evaluation 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. Continue operational test & evaluation of a lighter and hardened ship-to-shore fuel transport prototype to address mobility and compatibility requirements. Continue the development and testing of an unmanned underwater vehicle prototype, used with existing US Navy Electronic Harbor Security System (EHSS) and ARGUS expeditionary harbor security system for littoral threats. Initiate development of an enhanced harbor security capability through the integration of a passive and active acoustic sensor system. Irregular Warfare as a Core Competency. Complete and deliver an analytic tool that will predict specific subterranean activities. Complete development a subterranean geophysical survey kit. Complete development and delivery of a realistic, modular subterranean training fixture, made of novel materials and configured above ground that replicates a communications and GPS-denied environment. Complete development and evaluation of an Active Seismic Imaging (ASI) systems. Complete development and improvement of a proven ground based system that has been integrated onto a new type of aerial platform for detection of subterranean targets. Complete development and testing of a scanning system which will be able to maneuver independently inside confined spaces and provide situational awareness through live video feed. Complete development and testing of a subterranean communications system. Complete development of a mapping capability for subterranean, that creates unique 2D and 3D maps in real time. Complete development of a scanning drone system that is capable of operating inside a confined space. Complete development of a self-propelled module that can advance through confined spaces providing command and control and life support. Complete development of a tethered unmanned aerial vehicle that will safely conduct reconnaissance of confined spaces. Complete development of system that employs transmitters and receivers to detect a particular geophysical phenomenon. Complete operational test and evaluation of mobile lateral and vertical scanning technology to locate specific subterranean targets. Complete operational test and evaluation of a mobile system for standoff detection and mapping of geophysical phenomenon. Continue adaptation of a proven land system to an airborne detection system. Continue development of materials and methods for subterranean target destruction and collect data for modeling tools. Continue develop software for subterranean detection capability from ground surface indicators. Continue development and evaluation of an airborne system that can detect specific subterranean aspects without requiring line of sight. Continue development of a capability to neutralize subterranean targets. Continue development of a kinetic means in neutralizing tunnel shafts. Continue development of a passive sensor that will have the ability to detect subterranean targets. Continue development of a platform that integrates land-based sensors for conducting advanced geology surveys. Continue development of a platform that utilizes a network of airborne sensors to detect subterranean targets. Continue development of a system for detection of unique geology phenomena and testing and evaluation of the prototypes' performance in representative sites. Continue development of a tactical and easy-to-use tool, and the associated tactics, techniques and procedures that will enable an operator to monitor obstacles from a safe distance, in			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603122D8Z / *Combating Terrorism Technology Support*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
underground confined structures. Continue development of a vertical tripod mounted subterranean detection system. Continue development of algorithms using multiple data sources for improved subterranean detection. Continue development of an early warning detection system capable of monitoring long strips of area in the ground and/or water. Continue development of an operational capability to discover and map known and unknown subterranean shafts within a network. Continue development of unattended ground sensor systems to enable deployment, detection and tracking of targets in various geology environments. Continue modification of a system to enable subterranean communication among a network of multiple users and at longer ranges. Continue the identification methods to monitor chemical and biological hazards in a subterranean environment, and how to assess the risk to the operator and operations. Continue development of unattended sensors that include several sensing modalities that detect and track human activity and sends data to a command and control station. Continue development, integration and operational test and evaluation of an extended coverage system for border protection. Continue to deliver a subterranean operations pilot course that will provide Department of Defense and Interagency a holistic overview of the operational level considerations for planning and executing missions. Initiate a framework to rapidly evaluate new counter tunnel concepts, technologies and applications. Initiate development and evaluation of a system to enable subterranean communication for self-positioning among a network of multiple users and at longer ranges. Initiate development of an intelligence, surveillance and recognizance system for subterranean targets. Initiate development of a subterranean augmented reality and virtual reality training and tactical application. Initiate development of a system capable of mapping a subterranean network. Initiate development of an airborne variant subterranean detection system. Initiate development of three (3) subterranean fixtures for testing emerging technologies. Initiate development of a subterranean entry tool mitigating force exposure and enhancing force protection.			
FY 2022 Plans: Support Relationships to Address Significant Terrorist Threats. Complete development and testing of algorithms using machine learning for the detection of threats in Computed Tomography (CT) and x-ray screening systems. Continue the development and testing of a series of scaled tests on various types of masonry constructions subjected to blast loading. Integrate with the U.S. Interagency. 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. Complete test and evaluation of Ethylene-vinyl Acetate (EVA) laminated glass that will determine its blast protection performance as compared to Polyvinyl Butyral (PVB) laminated glass. 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. Complete 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.			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603122D8Z / *Combating Terrorism Technology Support*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Strengthen Alliances. Complete development and testing of an advanced active diver thermal protection system for long exposure dives, including SEAL Delivery Vehicle (SDV) operations. Complete development of an advanced active diver thermal protection system for long exposure dives, including SEAL Delivery Vehicle (SDV) operations. Complete integration of Human Injury Prediction (HIP) for Vulnerability Assessment and Protection Option (VAPO) 7 to effectively and accurately model the effects of an explosive event. Continue leveraging assets and capabilities in the area of HME materials characterization to support research efforts. Continue hosting bi-annual data exchange with foreign partners to leverage assets and capabilities to support each country's research efforts in the area of maritime security. Continue hosting bi-annual data exchange with foreign partners to exchange research/info on physical protection of facilities, to include but not limited to: entry control points, vehicle barriers, blast/ forced entry mitigation, and sensitive material destruction. Sustain Combating Terrorism. Complete the development and evaluation of a novel ship-to-shore fuel transport system with a down select of one tire design for an amphibious towable container that mitigates risk to personnel and fuel loss in the event of an attack. Complete operational test & evaluation of a lighter and hardened ship-to-shore fuel transport prototype to address mobility and compatibility requirements. Complete test and evaluation of an interoperable, detect-to-defeat capability to provide waterside security (ports and harbors) and against underwater littoral threats. Complete development of an enhanced harbor security capability through the integration of a passive and active acoustic sensor system. Complete the development of an unmanned underwater vehicle prototype, used with existing US Navy Electronic Harbor Security System (EHSS) and ARGUS expeditionary harbor security system for littoral threats. Complete operational test & evaluation of ATM-UPS in a fleet exercises and Department of Defense battle lab events. Complete operational test & evaluation of an unmanned underwater vehicle prototype in a fleet exercises and Department of Defense battle lab events. Initiate development and test an autonomous underwater vehicle capable of detect-to-defeat capability to provide waterside security (ports and harbors) and against underwater littoral threats. Enhance Survivability for close combat formations. Initiate development of an optical radar based system capable of providing CAT 1 coordinates supporting combat troops while also providing force protection. Initiate development Develop and design a Digital PTZ (Pan Tilt Zoom) camera and focusable thermal camera with a human detection range of 2KM and Identification of Intention (IOI) at 1KM. Irregular Warfare as a Core Competency. Complete develop software for subterranean detection capability from ground surface indicators. Complete development and conduct operational test and evaluation of a capability to neutralize subterranean targets. Complete development and conduct operational test and evaluation of a passive sensor that will have the ability to detect subterranean targets. Complete development and conduct operational test and evaluation of an operational capability to discover and map known and unknown subterranean shafts within a network. Complete development and evaluation of a system to enable subterranean communication for self-positioning among a network of multiple users and at longer ranges. Complete development and evaluation of an airborne system that can detect specific subterranean aspects without requiring line of sight. Complete			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603122D8Z / *Combating Terrorism Technology Support*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
development of an intelligence, surveillance and recognizance system for subterranean targets. Complete development of a platform that utilizes a network of airborne sensors to detect subterranean targets. Complete development of a scanning drone system that is capable of operating inside a confined space. Complete development of a subterranean augmented reality and virtual reality training and tactical application. Complete development of a system capable of mapping a subterranean network. Complete development of a system for detection of unique geology phenomena and testing and evaluation of the prototypes' performance in representative sites. Complete development of materials and methods for subterranean target destruction and collect data for modeling tools. Complete development of three (3) subterranean fixtures for testing emerging technologies. Complete development of unattended sensors that include several sensing modalities that detect and track human activity and send data to a command and control station. Complete development, integration and operational test and evaluation of an extended coverage system for border protection. Complete modification of a system to enable communication among a network of multiple users and at longer ranges. Complete the identification methods to monitor chemical and biological hazards in a subterranean environment, and how to assess the risk to the operator and operations. Continue a framework to rapidly evaluate new counter tunnel concepts, technologies and applications. Continue adaptation of a proven land system to an airborne detection system. Continue development of a kinetic means in neutralizing tunnel shafts. Continue development of a platform that integrates land-based sensors for conducting advanced geology surveys. Continue development of a tactical and easy-to-use tool, and the associated tactics, techniques and procedures that will enable an operator to monitor obstacles from a safe distance, in underground confined structures. Continue development of a vertical tripod mounted subterranean detection system. Continue development of algorithms using multiple data sources for improved subterranean detection. Continue development of an airborne variant subterranean detection system. Continue development of an early warning detection system capable of monitoring long strips of area in the ground and/or water. Continue development of unattended ground sensor systems to enable deployment, detection and tracking of targets in various geology environments. Continue to deliver a subterranean operations pilot course that will provide Department of Defense and Interagency a holistic overview of the operational level considerations for planning and executing missions. Initiate the development of training materials, conduct a technology assessment, and finalize an end-user graphical user interface. Initiate development of an autonomous and improved scanning system, capable of operating inside a confined space. Initiate and deliver an analytic tool with expanded capability with the incorporation of machine learning and associated training modules that will predict specific subterranean activities. Initiate development and improvement of a subterranean geophysical survey kit that will include a simplified deployment interrogation kit, data analysis and data processing. Initiate development of a miniaturized scout system for subterranean environments. Initiate development of a modified self-propelled module that can advance through confined spaces providing command and control and life support. Initiate development of a subterranean drilling technology. Initiate development of a system for tactical confined space life support. Initiate development of sensor package mounted on a support mammal for subterranean operations. Initiate development of a subterranean entry tool mitigating force exposure and enhancing force protection.			
FY 2021 to FY 2022 Increase/Decrease Statement:			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603122D8Z / *Combating Terrorism Technology Support*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Congressional adjustment made in FY 2021.			
Title: SURVEILLANCE, COLLECTION AND OPERATIONS SUPPORT	13.008	18.162	8.626
Description: Identify high-priority user requirements and special technology initiatives focused primarily on countering terrorism through offensive operations. Enhance US intelligence capabilities to conduct retaliatory or preemptive operations and reduce the capabilities and support available to terrorists and other adversaries as directed. ***FY 2021 Plans:*** Expand the Competitive Space, Enhance Survivability for Close Combat Forces, Integrate with the U.S. Interagency, and Sustain Combating Terrorism to Advance U.S. Influence and National Security Interests: Complete development of a new miniaturized Ultra High Frequency Band antenna or family of antennas. Complete classified project to develop a specialized antenna system. Complete classified project to develop waveform identification system. Complete classified project to develop a Media Exploitation capability. Complete Classified Personal Electronic Device (PED) Detect Signature Management effort. Complete Classified Surveillance and Signature Management effort to develop a low observable HD AV 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 Specialized High-Power Battery System (HPBS) for man portable applications. Continue development and testing of a single compact, gimbaled next generation Hyperspectral Imagery (HSI) aerial sensor in both SWIR and LWIR wavebands and provide industry standard data outputs. Continue spiral development of the Enhanced CALYPSO RFIC and integrated transceiver devices. Continue Classified Integrated Air Defense Geo-Location Technical Collection effort. Initiate classified Signature Management Project to develop a Persona Management capability. Initiate classified Technical Collection Project to develop new communication protocols that support counter surveillance operations. Initiate classified Special Communications Project to develop a new Thin Film antenna technical capability. Initiate classified Special Communications Project to develop a new short-range communications capability. Initiate classified Special Communications Project to develop a new Steerable Antenna technical capability. Strengthen Alliances and Sustain Combating Terrorism to Advance U.S. Influence and National Security Interests: Complete effort to develop a Hebrew Language Aptitude Battery (HILAB) Test capability. Complete development of High Altitude Pseudo Satellite payloads. Continue development and demonstration of a low profile tactical radio system with optimized performance. The system will enable ready exchange of information between mobile tactical users in a form factor that provides the flexibility to customize the configuration and achieve communications without or in an area with degraded infrastructure. ***FY 2022 Plans:*** Expand the Competitive Space, Enhance Survivability for Close Combat Forces, Integrate with the U.S. Interagency, and Sustain Combating Terrorism to Advance U.S. Influence and National Security Interests: Complete development and testing of a single compact, gimbaled next generation Hyperspectral Imagery (HSI) aerial sensor in both SWIR and LWIR wavebands and provide			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603122D8Z / *Combating Terrorism Technology Support*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
industry standard data outputs. Complete spiral development of the Enhanced CALYPSO RFIC and integrated transceiver devices. Complete Classified Integrated Air Defense Geo-Location Technical Collection effort. Continue classified Signature Management Project to develop a Persona Management capability. Continue classified Technical Collection Project to develop new communication protocols that support counter surveillance operations. Continue classified Special Communications Project to develop a new Thin Film Antenna technical capability. Continue classified Special Communications Project to develop a new short-range communications capability. Continue classified Special Communications Project to develop a new Steerable Antenna technical capability. Initiate development of enhanced capabilities against vehicular signals of interest and Cyber Convergent Technologies. Initiate development 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 and counter surveillance capabilities. Initiate the development of non-standard and specialized communications and technical collection capabilities to combat terrorists and other highly technical adversaries. Initiate development of signature management capabilities and new techniques that protect the force and support the collection and targeting process. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Congressional adjustment made in FY 2021.			
Title: Tactical Offensive Support (TOS)	21.058	10.993	8.943
Description: The Tactical Offensive 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 federal 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. ***FY 2021 Plans:*** Enhance Lethality for Close Combat Formations 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 test and evaluation of stabilized weapon mounts for employment on ground vehicles, airframes, and maritime platforms and when incorporating integrated fire control systems and auto-targeting technology. Complete development and testing of dual purpose improvised conventional munitions that comply with US safety standards and the US Cluster Munitions Policy of less than 1% UXO after firing the munition. Complete development of a small-unmanned aerial system that provides tactical ISR and enhanced lethality and is compliant with DoD cyber and encryption policies for UAS. Complete ammunition development that improves probability of hit at extended ranges by improving muzzle velocity, extreme spread and ballistic coefficient. Complete development of a window-breaching device for snipers that enables a single operator to remove glass obstructions prior to shooting. Complete development of a 120mm mortar			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603122D8Z / *Combating Terrorism Technology Support*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
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 development of a reusable VTOL ISR capability that is able to work cooperatively for persistent effects. Continue development of a mid-wave infrared thermal sight for use on lightweight medium machine guns and sniper rifles to enhance target identification. Continue development, delivery, and live fire troop training of sniper ballistic and downwind sensor systems to US, UK, Australia, and Canada to increase first round hit capability. Continue development of a next generation Lightweight Medium Machine Gun (LWMMG) and lightweight ammunition to give operators a distinct advantage in both the extended and close-in fight and be able to transition rapidly from mounted operations to dismounted operations. Continue development of a family of intermediate caliber weapon systems, including ammunition, for use in close quarters combat, marksmen, and individual weapon system roles to improve probability of hit. Continue to develop a hybrid dual-channel medium range weapon sight to perform in the near infrared and long wave infrared that provides a tactical advantage in detection and interdiction of targets at distance. Continue to develop a beyond line of sight loitering aerial missile, that is capable of locating and engaging enemy targets, armored and unarmored vehicles. The missile will provide advanced tactical situation and real-time video display that controls the missile throughout its mission using an intuitive interface with automated modes, which relieve the operator from most of the burdens associated with piloting an airborne loitering missile. Continue development of weapon system and supermatch, subsonic, signature-on-target and armor piercing ammunition to increase hit potential by 50% at extreme distances. Initiate development of a low cost, hand-launched, fast VTOL loitering munition that employs Electro-Optical and Infrared sensors for both day and night operations to improve SOF force protection and rapid attack capability. Initiate development of a machine gun round that allows operators to observe impact of their shots, make shot corrections and increase hit potential all without the threat of compromise, by the enemy. Initiate development of a ballistically matched Enhanced Performance Round (EPR) that allows snipers to transition from match grade rounds to EPR, thereby improving speed of engagement, accuracy and penetration. Enhance Survivability 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 lightweight ammunition packaging (LAP) for small caliber ammunition for Special Operations Forces, to include ammunition cans which lighten operational load and reduce packaging weight. Complete development and testing of a thermal camouflage material for soldier uniforms, vehicles, and hide sites. Complete development of an electronic warfare kit optimized for use in subterranean and complex urban terrain. Complete development of a remotely operated integrated lighting harness system for canines that operates based on mission activities. Complete High Frequency (HF) mobile ad-hoc network radio with a counter electronic warfare capability for tactical operators that is interoperable with legacy SOF HF radios. Complete development of tactical sUAS platform that enables operators with no sUAS flight experience to perform accurate maneuvers for indoor and outdoor ISR missions.			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603122D8Z / *Combating Terrorism Technology Support*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Continue to develop a tactical deployment and recovery capability for US and UK Navy SOF surface, subsurface and air assets that increases environmental protection and signature reduction while ensuring direct interoperability between US and UK forces. Continue to develop an overmatch optic that provides instant range, tracking and firing solution for multiple drones, which enables operators to kill drones at extended ranges during day and night operations. Initiate development of a wireless detonating device with programmable receivers that is interoperable with legacy demolitions. Initiate development of a rugged camera system that is mounted to rifle optics to collect and send data without interfering with normal operator activities. ***FY 2022 Plans:*** Enhance Lethality for Close Combat Formations Complete development of a mid-wave infrared thermal sight for use on lightweight medium machine guns and sniper rifles to enhance target identification. Complete development, delivery, and live fire troop training of sniper ballistic and downwind sensor systems to US, UK, Australia, and Canada to increase first round hit capability. Complete development of a next generation Lightweight Medium Machine Gun (LWMMG) and lightweight ammunition to give operators 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 a family of intermediate caliber weapon systems, including ammunition, for use in close quarters combat, marksmen, and individual weapon system roles to improve probability of hit. Complete development of a hybrid dual-channel medium range weapon sight to perform in the near infrared and long wave infrared that provides a tactical advantage in detection and interdiction of targets at distance. Complete development of a beyond line of sight loitering aerial missile, that is capable of locating and engaging enemy targets, armored and unarmored vehicles. The missile will provide advanced tactical situation and real-time video display that controls the missile throughout its mission using an intuitive interface with automated modes, which relieve the operator from most of the burdens associated with piloting an airborne loitering missile. Complete development of weapon system and supermatch, subsonic, signature-on-target and armor piercing ammunition to increase hit potential by 50% at extreme distances. Complete development of a low cost, hand-launched, fast VTOL loitering munition that employs Electro-Optical and Infrared sensors for both day and night operations to improve SOF force protection and rapid attack capability. Complete development of a machine gun round that allows operators to observe impact of their shots, make shot corrections and increase hit potential all without being compromised. Complete development of a ballistically matched Enhanced Performance Round (EPR) that allows snipers to transition from match grade rounds to EPR, thereby improving speed of engagement, accuracy and penetration. Enhance Survivability for Close Combat Formations Complete development of a tactical deployment and recovery capability for US and UK Navy SOF surface, subsurface and air assets that increases environmental protection and signature reduction while ensuring direct interoperability between US and UK			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603122D8Z / *Combating Terrorism Technology Support*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
forces. Complete development of an overmatch optic that provides instant range, tracking and firing solution for multiple drones, which enables operators to kill drones at extended ranges during day and night operations. Complete development of a wireless detonating device with programmable receivers that is interoperable with legacy demolitions. Complete development of a rugged camera system mounted on rifle optics to collect and send data without interfering with normal operator activities. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY21 includes Congressional Plus-up funding.			
Title: Human Performance and Training (HPT) ***Description:*** The HPT 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. HPT's capabilities are implemented globally to prepare for critical missions in any operational environment to identify, disrupt, and defeat threats. ***FY 2021 Plans:*** Build a More Lethal Force: Continue 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. Initiate 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. Irregular Warfare as a Core Competency: Complete the development and delivery of a synthetic Internet sandbox to enable intelligence analysts and information operations personnel to train on tools and methodologies for the collection, analysis, and exploitation of adversaries' online information, as well as engaging in large-scale Unconventional Warfare (UW) exercises, while mitigating the challenges and risks associated with training on the publicly visible Internet. 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. Enhance Survivability for Close Combat Formations: 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. Initiate the design and development of a multi-sensory (e.g., visual, auditory, tactile) and immersive military freefall jump master simulator to enhance classroom training and rehearsal of spotting techniques and aircraft procedures over virtual drop zones (DZ) modeled after real world DZs prior to going up in the air. Sustain Combating Terrorism: 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	8.058	17.338	5.414

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603122D8Z / *Combating Terrorism Technology Support*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
equipment in simulated field and lab settings. Complete the development of photorealistic immersive training environments to replicate high-risk scenarios and standardize curriculum for Explosive Ordnance Disposal technicians and other operators. Support Relationships to Address Significant Terrorist Threats: 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 response to natural language processing and force application. Expand the Competitive Space: Initiate the design and development of a Program of Instruction to teach SOF Operators advanced cyber and electronic warfare skills for cyber defense, resilience, and the increased integration of cyber capabilities into the full spectrum of military operations. . ***FY 2022 Plans:*** Build a More Lethal Force: 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. Continue 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. Initiate the development of immersive learning technology that adapts based on individual skills, behavioral responses and physiological responses during the evolution of a scenario to better prepare personnel for operational environments that are always dynamic and evolving. IW as a Core Competency: Continue the design and development of a Program of Instruction to teach SOF Operators advanced cyber and electronic warfare skills for defense, resilience, and the increased integration of such capabilities into the full spectrum of military operations. Initiate the development of training that leverages emerging human performance technologies and the latest research to improve decision-making and mental agility, optimize performance, enhance effectiveness, and boost resilience. Enhance Survivability for Close Combat Formations: Continue the design and development of a multi-sensory (e.g., visual, auditory, tactile) and immersive military freefall jump master simulator to enhance classroom training and rehearsal of spotting techniques and aircraft procedures over virtual drop zones (DZ) modeled after real world DZs prior to going up in the air. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Congressional adjustment made in FY 2021.			
Accomplishments/Planned Programs Subtotals	113.445	144.847	69.376

D. Other Program Funding Summary ($ in Millions)

N/A

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603122D8Z / *Combating Terrorism Technology Support*

D. Other Program Funding Summary ($ in Millions)

Remarks

N/A

E. Acquisition Strategy

N/A

THIS PAGE INTENTIONALLY LEFT BLANK

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603133D8Z / *Foreign Comparative Testing*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	110.082	24.510	25.115	25.432	-	25.432	-	-	-	-	-	-
313: *Foreign Comparative Testing*	110.082	24.510	25.115	25.432	-	25.432	-	-	-	-	-	-

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), Global Capability Programs (GCP) Office.

Measurable Outcomes:
-FCT projects will demonstrate capability objectives within 12-36 months.
-Over its 40-year history, FCT has a transition rate of 60 percent (364 out of 623) for completed projects. Of the 364 projects that tested successful, 284 or 72 percent resulted in follow on procurements of over $12.000 billion.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603133D8Z / *Foreign Comparative Testing*

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	24.970	25.183	25.784	-	25.784
Current President's Budget	24.510	25.115	25.432	-	25.432
Total Adjustments	-0.460	-0.068	-0.352	-	-0.352
• Congressional General Reductions	-	-0.068			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.456	-			
• Program Adjustments	-0.004	-	-0.352	-	-0.352

Change Summary Explanation

No significant funding changes.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603133D8Z / *Foreign Comparative Testing*	Project (Number/Name) 313 / *Foreign Comparative Testing*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
313: *Foreign Comparative Testing*	110.082	24.510	25.115	25.432	-	25.432	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

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 2020	FY 2021	FY 2022
Title: Hybrid Vertical Take-off and Landing (VTOL)/Fixed Wing Unmanned Aerial Systems (UAS) (Navy) ***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. This project enhances DoD capabilities in the Autonomous Systems focus area. Test articles received, bench testing completed, and comparative testing initiated in FY 2019. Comparative testing occurred throughout FY 2020 and is scheduled to complete in 1Q FY 2021. Program Manager (PM) will make a transition decision and a close out report will be completed in 2Q FY 2021 with FY 2020 funds.	0.115	-	-
Title: Pilot Physiology Based Autonomous Life Support System (Air Force) ***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 FY 2019. Performance testing occurred in 2Q FY 2020. Integration into pilot breathing system was completed in 3Q FY 2020. Safe-to-fly determination for stand-alone helmet will occur in 1Q FY 2021. A transition decision will occur and a close out report will be completed in 2Q FY 2021 with FY 2020 funds.	0.007	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603133D8Z / *Foreign Comparative Testing*	**Project (Number/Name)** 313 / *Foreign Comparative Testing*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Future X-Band Radar (Navy) ***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. Program Manager completed test planning and contracting for acquisition in FY 2019. If successful, this project will inform requirements for the X-band component of the Navy's Air and Missile Defense Radar program. Acceptance evaluation of test article occurred in 3Q FY 2020. A close out report will be completed and a procurement decision will occur in 3Q FY 2021 using FY 2020 funds.	1.000	-	-
Title: Long-Range Tactical Intelligence Surveillance and Reconnaissance (ISR) Targeting, and Strike System (Navy/USMC) ***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. This project enhances DoD capabilities in the Autonomous Systems focus area. 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. Flight testing previously scheduled for 3Q FY 2020 was delayed to 3Q FY 2021 due to COVID-19. Upon completion of flight testing, a close out report will be completed and a procurement decision will occur in 4Q FY 2021 with FY 2020 funds.	0.800	-	-
Title: Low Profile Satellite Communications (SATCOM) on the Move Antenna (Navy/USMC) ***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. This project enhances DoD capabilities in the Fully Networked Command, Control, and Communications (FNC3) focus area. If successful, the technology will transition to Marine Corps Networks on the Move program of record. Program Manager received test articles and acceptance testing initiated in FY 2019. Ku-band antenna certification testing completed in 4Q FY 2020. Ka-band antenna certification testing will occur in 1Q FY 2021. The Program Manager will make a transition decision and a close out report will be completed in 3Q FY 2021 with FY 2020 funds.	0.236	-	-
Title: Event-Based Sensing for Space & Directed Energy Applications (Air Force) ***Description:*** This project comparatively tests neuromorphic imaging technology and algorithms. This technology enhances daytime ground-based space situational awareness and directed energy test and evaluation. This project enhances DoD capabilities in the Directed Energy and Space focus areas. If successful, this project will transition to the Space and Missile Command's Ground Based Space Situational Awareness Program Office for follow-on demonstration and fielding. Test articles received and initial testing completed in FY 2019. Calibration testing was completed in 1Q FY 2020. Telescope integration	0.456	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603133D8Z / *Foreign Comparative Testing*	**Project (Number/Name)** 313 / *Foreign Comparative Testing*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
completed in 2Q FY 2020. This project has been delayed since 3Q FY 2020 due a lack of facility access caused by COVID-19 restrictions. Object tracking tests will occur in 1Q FY 2021. Event sensing tests will occur in 3Q FY 2021. A final close out report and transition decision will occur in 4Q FY 2021 with FY 2020 funds.			
Title: Improved Amphibious Track (Navy) ***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. Test planning and test article contract award occurred in 2Q FY 2019. Initial test articles received in 4Q FY 2019. Performance testing occurred throughout FY 2020 on test articles from one vendor. Installation and performance testing on test articles from second vendor were delayed due to COVID-19 and are scheduled to complete in 2Q FY 2021. The Program Manager will make a transition decision and a close out report will be completed in 3Q FY 2021 with FY 2020 funds.	1.628	-	-
Title: Synthetic Aperture Sonar for Mine Countermeasures Unmanned Underwater Vehicles (UUVs) (Navy) ***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. This project enhances DoD capabilities in the Autonomous Systems focus area. If successful, the technology will transition to Program Manager Naval Explosive Ordnance Disposal for integration on the Mk 18 UUV. Test planning and test article contract award occurred in 1Q-2Q FY 2019. Demonstration of real-time processing on a small UUV occurred in 3Q FY 2019. Test articles received in 4Q FY 2019. Sea trials on the test articles began in 1Q FY 2020. Ongoing sea trials have been delayed to 1Q FY 2021 due to COVID-19. The Program Manager will make a transition decision and a close out report will be completed in 3Q FY 2021 with FY 2020 funds.	0.309	-	-
Title: Active Expendable Decoys (Air Force) ***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 missiles. If successful, the technology will transition to F-15, F-16, and F-18 electronic warfare programs for procurement. Contract preparation occurred in FY 2019. In 2Q FY 2020, aircraft integration was completed. Full avionics testing occurred in 3Q FY 2020. Flight testing will occur 1Q FY 2021. Live demonstrations to occur in 3Q FY 2021. The Program Manager will make a transition decision and a close out report will be completed in 4Q FY 2021 with FY 2020 funds.	2.229	-	-
Title: Cryo-cooler for Electro-Optic Sensors (Air Force)	0.160	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603133D8Z / *Foreign Comparative Testing*	**Project (Number/Name)** 313 / *Foreign Comparative Testing*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Description: This project tests a new cryo-cooler technology for application to advanced infrared sensor systems for airborne platforms. This technology significantly increases reliability and reduces life cycle costs. If successful, this technology will transition into F-35 Electro-Optic Distributed Aperture System sensor. Laboratory testing occurred 3Q FY 2020. System integration occurred in 4Q FY 2020. Test report and close out report completes in 1Q FY 2021 with FY 2020 funds.			
Title: More Reliable, Longer Endurance, More Power Unmanned Aerial Systems (UAS) (Army) ***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. This project enhances DoD capabilities in the Autonomous Systems focus area. 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 continued throughout FY 2020 with FY 2019 funds. ***FY 2021 Plans:*** Testing at simulated altitudes will be completed in 1Q FY 2021. A transition decision will occur and a close out report will be completed in 2Q FY 2021. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Funding decreases from FY 2021 to FY 2022 as final testing is completed and project is closed out.	0.000	0.095	-
Title: Multi-Mission Weaponized Soldier - Unmanned Aerial System (Army) ***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 enhances DoD capabilities in the Autonomous Systems focus area. If successful, this technology will transition to the Joint Munitions & Lethality Life Cycle Management Command for follow on operational evaluations. This project initiated test planning and contract preparation in FY 2019. Contract was awarded 4Q FY 2020. ***FY 2021 Plans:*** 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 report will be completed in 4Q FY 2021. ***FY 2021 to FY 2022 Increase/Decrease Statement:***	0.215	0.075	-

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603133D8Z / *Foreign Comparative Testing*	**Project (Number/Name)** 313 / *Foreign Comparative Testing*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Funding decreases from FY 2021 to FY 2022 as final testing is completed and project is closed out.			
Title: Anti-Submarine Warfare Sensor Capabilities for Unmanned Surface Vehicles (Navy) ***Description:*** This project tests a compact towed variable depth sonar system for Navy Unmanned Surface Vehicles (USVs). This project enhances DoD capabilities in the Autonomous Systems focus area by providing autonomous sensor launch, recovery, and operation suitable for USVs. If successful, this technology will be available for transition to the Navy's Unmanned Maritime Systems Program Office for follow on acquisition and fielding. Test planning and contract preparation occurred in 4Q FY 2019. Test articles were received in 3Q FY 2020. Acceptance testing occurred in 4Q FY 2020. ***FY 2021 Plans:*** A demonstration event is scheduled in 2Q FY 2021. A transition decision and close out will be completed in 3Q FY 2021. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Funding decreases from FY 2021 to FY 2022 as final testing is completed and project is closed out.	0.750	0.300	-
Title: Hostile Fire & Pre-Shot Detection for Vehicle Protection Systems (Army) ***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. This project enhances DoD capabilities in the Autonomous Systems focus area. If successful, this technology will transition to the Army's Program Manager for Vehicle Protection Systems for initial fielding in 2022. Test articles received and initial testing, bench testing and safety certification occurred throughout FY 2020. ***FY 2021 Plans:*** Live demonstrations are planned for 1Q through 3Q FY 2021 with follow on vehicle integration testing in 4Q FY 2021. Final test and close out reports will be completed in 4Q FY 2021. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Funding decreases from FY 2021 to FY 2022 as final testing is completed and project is closed out.	0.615	0.750	-
Title: Dual Protocol Network Interface Card (Air Force) ***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. This project enhances DoD capabilities in the FNC3 focus area. If successful, this technology will transition to the Air Force Program Executive Office Fighter/Bombers for follow on procurement and fielding	0.674	0.034	-

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603133D8Z / *Foreign Comparative Testing*	**Project (Number/Name)** 313 / *Foreign Comparative Testing*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
on military aircraft. Initial test planning and contract preparation occurred in FY 2019. Test article received in 2Q FY 2020. Laboratory testing occurred in 3Q FY 2020. ***FY 2021 Plans:*** Flight demonstrations will be conducted from 1Q through 3Q FY 2021. A final ground demonstration will occur in 4Q FY 2021. The Program Manager will make a transition decision and a close out report will be completed in 4Q FY 2021. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Funding decreases from FY 2021 to FY 2022 as final testing is completed and project is closed out.			
Title: Mine Clearance Line Charge Replacement (Navy) ***Description:*** This project comparatively tests 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 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. Contract preparation occurred in 2Q FY 2020. Contract was awarded in 4Q FY 2020. ***FY 2021 Plans:*** Three phases of live fire testing will occur throughout FY 2021. This project continues in FY 2022 with FY 2021 funds. Live fire testing concludes and final test and close out reports are to be completed in 1Q FY 2022. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Funding decreases from FY 2021 to FY 2022 as final testing is completed and project is closed out.	1.470	0.585	-
Title: Turreted Mortar System (Army) ***Description:*** This project will test a turreted mortar system to fill 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. Contract preparation and award occurred in FY 2020. ***FY 2021 Plans:*** Live fire testing will occur 1Q-3Q FY 2021. This project continues in FY 2022. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Funding decreases from FY 2021 to FY 2022 as final testing is completed and project is closed out.	0.550	0.250	-
Title: Lightweight Short-Range Guided Missiles (USSOCOM)	0.550	0.550	0.250

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603133D8Z / *Foreign Comparative Testing*	**Project (Number/Name)** 313 / *Foreign Comparative Testing*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Description: 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. Test article contract award and test planning occurred in 4Q FY 2020. ***FY 2021 Plans:*** Test articles will be received in 1Q FY 2021. Laboratory performance testing continues through 2Q FY 2021. Live fire testing commences in 3Q FY 2021. ***FY 2022 Plans:*** This project continues in FY 2022 with completion of live fire testing, warhead characterization and final test and close out reporting. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Funding decreases from FY 2021 to FY 2022 as final testing is completed and project is closed out.			
Title: Advanced Closed Cycle Hull Cleaning (Navy) ***Description:*** This project comparatively tests robotic systems that capture and treat marine biofouling collected during undersea hull cleaning operations. This will improve the DoD's global environmental compliance posture and increase operational readiness as existing methods of hull cleaning do not comply with new environmental regulations, particularly on the west coast of the United States due to the creation of biofouling. If successful, the Naval Sea Systems Command's Salvage and Diving office will transition the technology through updating contractor hull cleaning requirements. Contract preparation and test planning took place in 4Q FY 2020. ***FY 2021 Plans:*** Test articles will be received in 2Q FY 2021. Field testing will occur in 3Q FY 2021. ***FY 2022 Plans:*** Water sampling analysis will take place in 1Q FY 2022. The second round of field testing will occur in 3Q FY 2022. Test report will be completed in 4Q FY 2022. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Funding increases from FY 2021 to FY 2022 to support major test events.	0.075	0.504	0.509
Title: Software Defined Acoustic Modem Evaluation (Navy)	0.056	0.553	0.482

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603133D8Z / *Foreign Comparative Testing*	**Project (Number/Name)** 313 / *Foreign Comparative Testing*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Description: This project comparatively tests commercial software-defined radios in underwater acoustic environments. This technology enables interoperable, reliable and secure communication between surface and subsurface platforms and sensors. If successful, this technology will transition to the Naval Undersea Warfare Center Newport Division for inclusion in follow-on large-scale prototype undersea network demonstration programs for further evaluation. Contract preparation and test planning occurred in 4Q FY 2020. ***FY 2021 Plans:*** Test articles are to be received and bench tested in 2Q FY 2021. In water testing will begin in 4Q FY 2021. ***FY 2022 Plans:*** Controlled in-water testing will be completed in 1Q FY 2022. Final demonstration event will occur in 3Q FY 2022. Project will close out and test report completed by 4Q FY 2022. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Funding decreases from FY 2021 to FY 2022 as final testing is completed and project is closed out.			
Title: Semi-Autonomous Devices for Medical Care (Army) ***Description:*** This project evaluates interoperable medical devices such as ventilators and IV pumps that can be remotely controlled. This could result in improving the quality and safety of patient care by enabling immediate adjustment of device settings without delays. ***FY 2021 Plans:*** Contract preparation and award will occur in 1Q FY 2021 with test articles received in 2Q FY 2021. Phase one developmental testing will occur in 3Q FY 2021. Go or no-go decision for phase two testing will occur in 4Q FY 2021. ***FY 2022 Plans:*** Phase two interoperability testing will finish in 3Q FY 2022. The Program Manager will make a transition decision and a close out report will be completed in 4Q FY 2022. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Funding decreases from FY 2021 to FY 2022 as final testing is completed and project is closed out.	0.000	0.870	0.630
Title: Top Attack Armor (Army) ***Description:*** This project comparatively tests improved vehicle protection technology for defeating overhead threats to Armored Fighting Vehicles. This provides protection against modern anti-tank threats while minimizing negative mobility impact. ***FY 2021 Plans:***	0.000	0.400	1.100

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603133D8Z / *Foreign Comparative Testing*	**Project (Number/Name)** 313 / *Foreign Comparative Testing*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Contract preparation and award will occur in 3Q FY 2021 with test articles received in 2Q FY 2021. Phase one developmental testing will occur in 4Q FY 2021. Laboratory validation testing will occur in 4Q FY 2021. ***FY 2022 Plans:*** Phase two field testing will occur in 2Q FY 2022. Project will close out and test report completed as well as go or no-go procurement decision will be made by 4Q FY 2022. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Funding increases from FY 2021 to FY 2022 to support major test events.			
Title: Airborne Threat Discrimination Sensors (Navy) ***Description:*** This project comparatively tests wide field of view electro-optic and infrared sensors for land and ship platforms as a complement to radar. This enables passive detection and tracking of challenging airborne threats. ***FY 2021 Plans:*** Contract preparation and award will occur in 2Q FY 2021 with test articles received in 4Q FY 2021. Phase one laboratory characterization testing will also occur in 4Q FY 2021. ***FY 2022 Plans:*** Phase one collection of field data will take place in 1Q FY 2022. Phase two collection will take place in 3Q FY 2022. The Program Manager will make a transition decision and a close out report will be completed in 4Q FY 2021. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Funding decreases from FY 2021 to FY 2022 as test events are completed.	0.000	1.050	0.250
Title: 1000V DC Power Systems for Directed Energy (Navy) ***Description:*** This project evaluates an off-the-shelf large scale energy storage system designed for maritime use. This supports development of next generation directed energy weapons systems for naval platforms. If this comparative test is successful, Program Executive Office (PEO) Electric Ships will then add this to a Program of Record (PoR). ***FY 2021 Plans:*** Contract preparation and award will complete in 2Q FY 2021. Test articles will be received in 3Q FY 2021. ***FY 2022 Plans:*** Phase one of the comparative test will complete in 2Q FY 2022. Phase two of the comparative test will complete in 3Q FY 2022. Project will close out and test report completed by 4Q FY 2022. ***FY 2021 to FY 2022 Increase/Decrease Statement:***	0.000	0.616	0.755

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603133D8Z / *Foreign Comparative Testing*	**Project (Number/Name)** 313 / *Foreign Comparative Testing*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Funding increases from FY 2021 to FY 2022 to support major test events.			
Title: Cold Weather All-Terrain Vehicle (Army) ***Description:*** This project comparatively tests off-the-shelf cold weather capable tracked vehicles with enhanced off-road mobility. This accelerates the fielding of a replacement for an obsolete system and enables logistics support in austere conditions. If successful, this technology will transition to Cold Region Test Center (CRTC), Alaska for further testing. ***FY 2021 Plans:*** Prototype contract preparation and award will complete in 1Q FY 2021. Test articles expected to be received in 2Q 2021. Production contract preparation and award begins in 3Q FY 2021. This project continues in FY 2022 with FY 2022 funds. ***FY 2022 Plans:*** Production contract award expected to be completed 3Q FY 2022. First article test and production test to be completed in 3Q FY 2022. Final test report, procurement decision, and project close out to occur in 4Q FY 2022. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Funding remains constant in FY 2022 to support on-going test events.	0.000	0.500	0.500
Title: Future Aviation Ground Power Unit (Army) ***Description:*** This project evaluates a modern, off-the-shelf aviation support system for military rotary wing aircraft. Improves aviation maintenance efficiency and reduces aircraft downtime. If successful, FCT will support the ongoing assessment and down-select of vendors to support the transition to a PoR. ***FY 2021 Plans:*** Contract preparation and award will complete in 2Q FY 2021. Test Plan expected to be begin in 3Q 2021. This project continues in FY 2022 with FY 2022 funds. ***FY 2022 Plans:*** Testing expected to begin 2Q FY 2022. Final test report, procurement decision, and project close out to be completed in 4Q FY 2022. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Funding increases in FY 2022 to support major test events.	0.000	0.500	1.260
Title: Precision Strike Missile Submunitions (Army)	0.000	0.754	0.700

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603133D8Z / *Foreign Comparative Testing*	**Project (Number/Name)** 313 / *Foreign Comparative Testing*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Description: Comparatively tests sensor fuzed submunitions for the Army's next generation, long-range precision strike missile. Provides increased lethality against armored targets while maintaining treaty compliance. If successful, technology will have a signed transition agreement with PEO Missiles & Space (M&S) for insertion into the Precision Strike Missile (PrSM) Program. ***FY 2021 Plans:*** Contract preparation will occur in 1Q FY 2021. Test planning will occur in 2-3Q FY 2021. Contract award will occur in 4Q FY 2021. This project will continue in FY 2022 with FY 2022 funds. ***FY 2022 Plans:*** Precision Strike Missile Submunitions (Army): Test item manufacture begins 1Q FY 2022. Testing to occur in 2-3Q FY 2022. Final test report, procurement decision, and project close out to be completed in 4Q FY 2022. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Funding decreases in FY 2022 to support project completion and close out.			
Title: Low Cost Innovative Projects (Projects Less Than One Million Dollars Each): ***Description:*** The OSD Global Capability Programs (GCP) Office in execution of the FCT Program selects multiple low-cost projects in the areas of Force Application, Force Protection, Force Support, Logistics, Artificial Intelligence and Machine Learning, 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. Projects: -Civil Affairs Solution-Army Analytics (USSOCOM): This project tests intelligence software that fuses imagery from Unmanned Aerial Systems and satellites with other sensor data and uses Artificial Intelligence and Machine Learning (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 enable dynamic planning for large scale operations. This project enhances DoD capabilities in the AI/ML focus area. If successful, this technology will be available for transition to the Army's Distributed Common Ground System Program of Record. Test planning occurred in 4Q FY 2019. Test article contract award completed in 3Q FY 2020. -Insensitive Munitions Fuze for the M67 Fragmentation Hand Grenade (Army): Comparatively tests off-the-shelf hand grenade fuzes to provide increased safety to the operator 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 the Army's Program Executive Office for Ammunition for follow on acquisition. Test articles delivered,	12.615	15.519	6.585

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603133D8Z / *Foreign Comparative Testing*	**Project (Number/Name)** 313 / *Foreign Comparative Testing*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
and initial safety testing occurred in 4Q FY 2019 through 3Q FY 2020. This project continues in FY 2021 with FY 2020 funds. Final testing and close out report will be completed by 2Q FY 2021. -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 small Unmanned Aerial Systems. 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 and Supercarrier I-Stalker programs. Test articles received and acceptance testing occurred in FY 2019. Shipboard testing of the sensor was scheduled for 2Q FY 2020; however, was delayed due to the COVID-19. The Program Manager will make a transition decision and a close out report will be completed in 3Q FY 2021. The project will continue into FY 2021 with FY 2020 funds. -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 2020 for the military aviation community. The Program Manager will make a transition decision and a close out report will be completed in 2Q FY 2021. This project continues in FY 2021 with FY 2020 funds. -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. Performance evaluation occurred in FY 2020. Final testing to be completed in 2Q FY 2021 with FY 2020 funds. The Program Manager will make a transition decision and a close out report will be completed in 3Q FY 2021. -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, initiated live fire testing in 1Q FY 2020 and completed bench testing in 2Q FY 2020. This project continues in FY 2021 with FY 2020 funds. -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			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603133D8Z / *Foreign Comparative Testing*	**Project (Number/Name)** 313 / *Foreign Comparative Testing*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
2019. Operational assessment conducted in 4Q FY 2020. This project continues in FY 2021 with FY 2020 funds and a close out report will be completed in 2Q FY 2021. -Individual Assault Munition (Army): This project tests a new warhead for existing shoulder fired weapon systems 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. Acceptance and firing testing completed in 3Q FY 2020. Airdrop test will occur 2Q FY 2021. This project continues in FY 2021 with FY 2020 funds. -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 2Q FY 2019. Safety certification and integration with platforms occurred in 4Q FY 2019. Tuning and endurance flights were completed in 4Q FY 2020. This project will close out and final test report produced by 1Q FY 2021. This project continues in FY 2021 with FY 2020 funds. -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 for the underwater acoustic sensor initiated in FY 2019. Final test evaluation of the sensor was scheduled for 4Q FY 2020 but was delayed until 1Q FY 2021 due to COVID-19. A close out report is expected in 1Q FY 2021 using FY 2020 funds. -105 Millimeter Family of Multi-Purpose Munitions (Army): This project tests two variants of a multi-purpose 105 millimeter(MM) munitions including high explosive 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. Test articles delivered in 4Q FY 2020. This project continues in FY 2021 with FY 2020 funds. -Uncooled 120 Hertz Longwave Infrared Focal Plane Arrays for Night Vision Sensors (Army): This project comparatively 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 2020. This project continues in FY 2021 with FY 2020 funds.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603133D8Z / *Foreign Comparative Testing*	**Project (Number/Name)** 313 / *Foreign Comparative Testing*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
-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 was completed 3Q FY 2019. Platform and static drop tests were completed in 1Q FY 2020. Air drop testing scheduled for 3Q FY 2020 is on hold due to COVID-19 delays and will resume in FY 2021. -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. Test article received in 2Q FY 2020. Range testing that had been scheduled for 3Q FY 2020 remains on hold due to COVID-19 delays. This project continues in FY 2021 with FY 2020 funds. -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 was initiated out-of-cycle in 4Q FY 2019. Initial test planning and contract preparation occurred in 4Q FY 2019. Operational testing scheduled for 4Q FY 2020 was delayed due to COVID-19. This project continues in FY 2021 with FY 2020 funds. -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. Test article received in 1Q FY 2020. Acceptance tests completed in 2Q FY 2020. -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. Initial test planning and contract preparation occurred in FY 2019. Test articles received in 2Q FY 2020. Evaluation with legacy hypersonic codes began in 3Q FY 2020. This project continues in FY 2021 with FY 2020 funds.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603133D8Z / *Foreign Comparative Testing*	**Project (Number/Name)** 313 / *Foreign Comparative Testing*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
-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 research, development, 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. Test articles received in FY 2020. -Enhancing DoD Infrastructure Repair (Army): This project evaluates a rapid setting polymer-based mortar for repair of damaged airfield runways and critical infrastructure. This will increase readiness and significantly reduce shipping costs by providing a qualified material source that meets performance requirements in theater. If successful, the Army's Engineering Research & Development Center will include this product as an approved rapid airfield damage repair capping material. Contract preparation and test planning initiated in 4Q FY 2020. -Rapid Response Fentanyl Test Strips (Army): This project evaluates the efficacy of commercially available rapid immunoassay test strips to detect the presence of fentanyl and its analogs. This provides an easy to use, small, low cost detection method that does not require power chemicals. If successful, the Joint Program Executive Office for Chemical Biological Defense will transition this technology into Reactive-Chemistry Orthogonal Surface and Environmental Threat Ticket Array (ROSETTA) Program of Record. Contract preparation and test planning occurred in 4Q FY 2020. -Extended Reality (XR) Helmet Mounted Display (Navy): This project comparatively tests emerging XR technologies for T-6B operational flight trainers. This will increase training effectiveness while significantly reducing costs and footprint versus legacy flight training systems. If successful, this technology will transition to the Naval Aviation Training Systems and Ranges Program Office for follow on acquisition. Contract preparation and test planning occurred in 4Q FY 2020. -Space Qualification Testing of Event-Based Sensors (Air Force): This project comparatively tests neuromorphic imaging sensor technology under simulated space conditions. This technology offers advantages in performance, size, weight, power, and signal processing that are suitable for space-based applications. If successful, this technology will transition to follow-on high altitude. Contract preparation completed in 4Q FY 2020. Testing continues in FY 2021 with FY 2021 funds. -Precision Vertical Take-off Unmanned Aerial System (VTUAS) (Navy): This project evaluates an ultrasound navigation aid to autonomously guide the landing of VTUAS on moving platforms in all weather conditions. This increases survivability by reducing operator exposure to threats while conducting VTUAS recovery. If successful, this will transition to Navy and Marine Corps Small Tactical Unmanned Aircraft Systems Program Office. Test article contract awarded in 3Q FY 2020. Test articles received in 4Q FY 2020.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603133D8Z / *Foreign Comparative Testing*	**Project (Number/Name)** 313 / *Foreign Comparative Testing*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
-Accelerating Human Performance Discovery (Army): This project evaluates an advanced fluorescence microscope with live-cell imaging and analysis against existing capabilities. This technology greatly reduces analysis time from weeks to hours of live-cell imaging and streamlines the development of human performance optimization products. If successful, this technology will transition to the Army's Combat Feeding Directorate and other Service laboratories for continued human performance research & development activity. Contract awarded and test articles received in 4Q FY 2020.			
-Counter-Unmanned Aircraft Systems (C-UAS) for Vehicle Protection Systems (Army): This project evaluates an autonomous system that combines passive UAS detect, locate, identify and intercept for potential application to ground combat vehicles. This technology eliminates the need to integrate separate C-UAS detect and defeat systems. If successful, this technology will transition to the Army's Product Manager for Vehicle Protection Systems for follow-on acquisition. Contract preparation and test planning occurred in 4Q FY 2020.			
-High Power Phased Array Radar (HPAR) (Air Force): This project demonstrates an expeditionary S-band active electronically steered array radar with digital beamforming. This technology provides long range surveillance, detection, and tracking of aerial targets in complex electromagnetic and operational environments. This project enhances DoD capabilities in the Air and Missile Defense focus area. If successful, this technology will transition to the Air Force's Three-Dimensional Expeditionary Long Range Radar Program of Record. Contract preparation and test planning occurred in 4Q FY 2020. Comparative demonstration scheduled to occur in 1Q FY 2021 with FY 2020 funds.			
-Nano-Clay Seals for Long Service Life (Air Force): This project evaluates the service life of emerging nano-clay enhanced compression O-ring seal materials against existing nitrile rubber. This technology significantly reduces aircraft engine life cycle costs. If successful, the Air Force Research Laboratory will modify current military specifications and the technology will be available for purchase through the Defense Logistics Agency. Contract awarded in 3Q FY 2020.			
-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. Operational demonstration that was due to take place in 3Q FY 2020 was delayed due to COVID-19 and will now occur in 2Q FY 2021. PM will make a transition decision and close out report will be completed by 4Q FY 2021.			
FY 2021 Plans: -Civil Affairs Solution-Army Analytics (USSOCOM): Visual analysis testing will begin in 2Q FY 2021. The project will close out and test report written by 4Q FY 2021.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603133D8Z / *Foreign Comparative Testing*	**Project (Number/Name)** 313 / *Foreign Comparative Testing*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
-Precision Vertical Take-off Unmanned Aerial System (VTUAS) (Navy): Field testing will occur in 2Q FY 2021. Operational and vulnerability testing will complete in 4Q FY 2021. -Extended Reality (XR) Helmet Mounted Display (Navy): Contract award is expected by 1Q FY 2021. Test articles should be received by 3Q FY 2021. -105 Millimeter Family of Multi-Purpose Munitions (Army): Ballistic testing of the ammunition at the Yuma Proving Grounds will begin in 2Q FY 2021. The project will close out and test report written by 3Q FY 2021. -Modular Airdrop Platform (Army): Final airdrop test will take place in 2Q FY 2021. The project will close out and test report will be written by 3Q FY 2021. -Counter-Unmanned Aircraft Systems (C-UAS) for Vehicle Protection Systems (Army): Contract award and receipt of test articles expected to occur by 2Q FY 2021. System demonstration is scheduled for 3Q FY 2021. The project will close out with a transition decision in 4Q FY 2021. -Enhancing DoD Infrastructure Repair (Army): Test articles will be received in 1Q FY 2021. Laboratory and field testing is scheduled to occur in 3Q FY 2021. This project will close out and test report completed in 4Q FY 2021. -Artificial Intelligence (AI) Neuromorphic Chip (Army): Bench testing of AI chip will complete in 2Q FY 2021. The project will close out and test report will be written by 3Q FY 2021. -Rapid Response Fentanyl Test Strips (Army): Test articles will be received in 1Q FY 2021. Laboratory testing will occur in 2Q FY 2021. Operational testing and military utility assessments will occur in 3Q FY 2021. This project will close out and test report completed in 4Q FY 2021. -Accelerating Human Performance Discovery (Army): Acceptance testing will occur in 1Q FY 2021. A basic research study on the enhanced microscope will take place from 2Q through 3Q FY 2021, and an applied research study will begin in 4Q FY 2021. This project will continue into FY 2022 with FY 2021 funds. -High Powered Microwave (HPM) Electro-Optic Electromagnetic Field Sensors (Air Force): Laboratory demonstration of sensors is scheduled for 2Q FY 2021. Down select of candidate sensors will take place in 3Q FY 2021. This project will close out with final test report completed by 4Q FY 2021.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603133D8Z / *Foreign Comparative Testing*	**Project (Number/Name)** 313 / *Foreign Comparative Testing*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
-Nano-Clay Seals for Long Service Life (Air Force): This project evaluates the service life of emerging nano-clay enhanced compression O-ring seal materials against existing nitrile rubber. This technology significantly reduces aircraft engine life cycle costs. If successful, the Air Force Research Laboratory will modify current military specifications and the technology will be available for purchase through the Defense Logistics Agency. Compression performance testing scheduled to occur in 1Q FY 2021. Field testing will complete in 2Q FY 2021. The project will close out with a transition decision in 4Q FY 2021. -Space Qualification Testing of Event-Based Sensors (Air Force): This project comparatively tests neuromorphic imaging sensor technology under simulated space conditions. This technology offers advantages in performance, size, weight, power, and signal processing that are suitable for space-based applications. If successful, the technology will team with Space & Missile Command or Army Project Insight that are planning demos from high altitude & and space-based layers. Contract expected to be awarded in 1Q FY 2021. Test articles will be received in 3Q FY 2021 with acceptance testing starting in 4Q FY 2021. This project continues in FY 2022 with FY 2022 funds. -Comparative Real-Time Air Quality Sensing (Air Force): This project evaluates an active in-line pilot breathing air- monitoring capability in high performance military aircraft. This will accelerate the delivery of technology that addresses an urgent operational need for the Air Force. If successful, technology will transition to PORs through Air Force Life Cycle Management Center (AFLMC) with support from Air Combat Command (ACC). Contract preparation and award will complete in 2Q FY 2021. Two custom test articles expected to be received in 4Q FY 2021. Phase 1-3 testing to be completed in 4Q FY 2021. Phase 4 testing to begin 4Q FY 2021. This project continues in FY 2022 with FY 2022 funds. -Jet Engine Precooler to Enable High-Speed Flight (Air Force): This project evaluates a full scale heat exchanger technology for precooling jet engine airflow at high speeds. This supports next generation commercial and military high supersonic and hypersonic research and development programs. If successful, this technology will continue to engage with AFRL, DARPA and working with major engine & airframe primes to create new POR to develop a platform scale, high-speed jet engine. Contract preparation and award to be completed in 1Q FY 2021. Test article preparation and integration begins 1Q FY 2021. Pre-cooler testing to be completed 4Q FY 2021. Final Report to be completed in 4Q FY 2021. -Airborne Lean Services Architecture - Phase II (Air Force): Evaluates a network architecture configuration management system with message protocols suitable for systems in forward deployed environments. Enables rapid and flexible interoperability between disparate systems across different radio networks. If successful, technology will transition to the Special Warfare Technology Integration and Support Center for further testing and evaluation. Phase 2 Development, Integration, Labs to be completed in 1Q FY 2021. Phase 2 Test / Demo / Report to be completed in 2Q FY 2021. Phase 3 Operational Testing to complete 3Q FY 2021. Final Analysis and Report to be completed in 3Q FY 2021.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603133D8Z / *Foreign Comparative Testing*	**Project (Number/Name)** 313 / *Foreign Comparative Testing*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
-Non-kinetic Defeat of Small Unmanned Aerial Systems (Army): This project evaluates a non-kinetic counter-unmanned aerial system for vehicles and fixed site configurations. This increases the probability of defeat while reducing collateral damage. If successful, this technology will be integrated with Medusa and fielded to the most vulnerable bases through USAF LCMC. Contract award and test article delivery expected in 2Q FY 2021. Initial performance test to begin 3Q FY 2021. This project continues in FY 2022 with FY 2022 funds. -Vehicle Mounted Camouflage (Army): This project comparatively tests vehicle coverings that reduce detection across multiple spectrum bands including infrared, microwave, and radar which could result in increased survivability in contested environments. Contract preparation and award will complete in 3Q FY 2021. Test articles will be received in 3Q FY 2021. Laboratory testing will begin in 4Q FY 2021. This project continues in FY 2022 with FY 2022 funds. -Water Free Chemical Decontaminant System (Army): This project evaluates a decontaminant agent, GD-6, for residual agent contamination testing and contact transfer hazards testing with various materials. This agent/decontaminant would allow for forward deployed personnel and their gear to be decontaminated without water and minimize the need to transfer critical equipment, thus enhancing readiness and resilience of the force. Contract preparation and award will complete in 3Q FY 2021, and test article will be received in 4Q FY 2021. -Water/Land Initiated Sensing Aerial Disconnect (USSOCOM): This project evaluates an airdrop system enhancement that automatically disconnects restraints once it has reached its destination. This system would enable fully autonomous delivery and derigging of unmanned systems and vehicles via airborne transport platforms. Contract preparation and award will complete in 1Q FY 2021. Test article will be received in 2Q FY 2021. Phase one ground testing will be conducted in 3Q FY 2021. -Active Protection Systems for Light Armored Vehicles (Navy/USMC): This project evaluates a vehicle mounted system that autonomously detects, tracks, and engages threats with both Hard and Soft Kill countermeasures. This will increase the combat capabilities of light armored vehicles against rocket propelled grenades and anti-tank missiles. Contract preparation and award will occur in 2Q FY 2021. Test articles will be delivered in 3Q FY 2021. Integrated test stand firing will be completed in 4Q FY 2021. -Organic Precision Fires – Infantry, Light (Navy/USMC): This project comparatively tests Group 1 loitering munitions. This provides an organic asset with precise kinetic effects within a Marine Infantry Company. Contract preparation and award will complete in 3Q FY 2021. Test articles will be received in 4Q FY 2021. This project continues in FY 2022 with FY 2022 funds.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603133D8Z / *Foreign Comparative Testing*	**Project (Number/Name)** 313 / *Foreign Comparative Testing*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
-Portable High Power Directed Energy Systems for Aviation Support (Navy): This project evaluates a portable high power laser system capable of removing aircraft corrosion and coatings in operational environments. This reduces the health risk to maintenance personnel and increases maintenance efficiency. Contract preparation and award will take place in 2Q FY 2021. Test article will be received in 3Q FY 2021. Phase one validation testing will begin in 4Q FY 2021.			
FY 2022 Plans: -Extended Reality (XR) Helmet Mounted Display (Navy): Integration of the XR helmet display with the cockpit will occur in 2Q FY 2022. A evaluation report will be produced by 3Q FY 2022. The project will close out with a transition decision in 4Q FY 2022.			
-Space Qualification Testing of Event-Based Sensors (Air Force): Space Qualification Testing and Orbital mission assessment completed in 1Q FY 2022. Mission assessment and recommendation reports commence in 2Q FY 2022. Final report and project close out to occur in 4Q FY 2022.			
-Comparative Real-Time Air Quality Sensing (Air Force): Phase 4 testing to be completed in 2Q FY 2022. Phase 5 testing to be completed in 3Q FY 2022. Technology demonstration to occur in 4Q FY 2022. A procurement decision will be made and a close out report will be submitted in 4Q FY 2022.			
-Jet Engine Precooler to Enable High-Speed Flight (Air Force): Project will close out in 4Q FY 2021.			
-Non-kinetic Defeat of Small Unmanned Aerial Systems (Army): Cueing sensor integration begins 1Q FY 2022. Final test report, procurement decision, and project close out to be completed in 2Q FY 2022.			
-Vehicle Mounted Camouflage (Army): Field testing of the camouflage will take place in 1Q FY 2022. Test report and procurement decision will be made in 2Q FY 2022. ($0.350 million FY 2022).			
-Water Free Chemical Decontaminant System (Army): Limited efficacy testing and equipment compatibility testing of the decontaminant agent will take place between 1Q FY 2022 and 3Q FY 2022. Test report will be completed by 4Q FY 2022 which will used by the Program of Record owner to support follow on demonstrations and procurement decision. ($0.080 million FY 2022).			
-Water/Land Initiated Sensing Aerial Disconnect (USSOCOM): User evaluation will take place in 1Q FY 2022. Project will close out and evaluation report completed in 2Q FY 2022.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603133D8Z / *Foreign Comparative Testing*	**Project (Number/Name)** 313 / *Foreign Comparative Testing*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
- Active Protection Systems for Light Armored Vehicles (Navy/USMC): Live fire testing will take place in 1Q FY 2022. Project will close out and procurement decision made by PEO Land Systems in 3Q FY 2022. -Organic Precision Fires – Infantry, Light (Navy/USMC): Phase one flight testing will take place in 1Q FY 2022 with a down select to one vendor. Phase two evaluation testing will take place in 2Q FY 2022. Project will complete and procurement decision made by PM to be included in the Aerial Loitering Munitions program in 2Q FY 2022. ($0.400 million funding) -Portable High Power Directed Energy Systems for Aviation Support (Navy): Phase one validation testing will complete in 2Q FY 2022. Field trials will take place in 3-4Q FY 2022. Project will complete and, if successful, this item will be added to the Authorized Equipment Lists for Naval and Marine squadrons in 4Q FY 2022. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Funding decreases from FY 2021 to FY 2022 as currently selected projects complete their 12-36 month evaluation and are transitioned.			
Title: Foreign Comparative Testing Prototype Focus Areas	0.000	1.210	12.411
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 evaluation 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. ***FY 2021 Plans:*** For FY 2021, fifty-eight proposals were submitted by the Services and USSOCOM requesting $48.851 million in FCT funds to support new projects. As a result, seventeen projects were selected for funding. Deliverables will include integrated products that enhance warfighting capabilities across multi-domain battlefield environments. 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. Remaining funds will be used to support priority out-of-cycle efforts to rapidly address emerging needs. ***FY 2022 Plans:*** FCT anticipates supporting ten to fifteen new projects spread across the focus area priorities in FY 2022. Deliverables will include integrated products and software that enhance warfighting capabilities across multi-domain battlefield environments. This will be			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603133D8Z / *Foreign Comparative Testing*	**Project (Number/Name)** 313 / *Foreign Comparative Testing*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
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. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** This funding will be allocated for the selection of new projects that will commence in FY 2022. Projects will be selected through a merit-based process and will address current and future OUSD R&E modernization priorities. Funding increases from FY 2021 to FY 2022 due to completion of on-going projects from prior years.			
Accomplishments/Planned Programs Subtotals	24.510	25.115	25.432

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.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603183D8Z / *Joint Hypersonic Technology Development & Transition*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	-	0.000	0.000	51.340	-	51.340	-	-	-	-	-	-
066: *Joint Hypersonic Transition Office (JHTO)*	-	0.000	0.000	51.340	-	51.340	-	-	-	-	-	-

Note

The Joint Hypersonics Transition Office (JHTO) is not a new start program, but was created in FY 2020 as a result of a Congressional add that highlighted the threats to national security posed by hypersonic weapons and the need to better synchronize hypersonic technology development and workforce development. Funding transfer from the Prompt Global Strike Capability Development Program Element (0604165D8Z), Project code 065, Joint Hypersonics, is to better align the hypersonic mission and budget activity with the congressional intent.

A. Mission Description and Budget Item Justification

The Joint Hypersonics Transition Office (JHTO) within the Office of the Under Secretary of Defense for Research and Engineering (OUSD(R&E) was created to establish a university consortium for hypersonics research and support workforce development; expedite testing, evaluation, and acquisition of hypersonic technologies to meet the stated needs of the warfighter, including flight testing, ground-based-testing, and underwater launch testing; ensure that prototyping demonstration programs on hypersonic systems integrate advanced technologies to speed the maturation and deployment of future hypersonic systems; develop strategies and roadmaps for hypersonic technologies to enable the transition of such technologies to future operational capabilities for the warfighter; and develop and implement a strategy for enhancing the current and future hypersonics workforce.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	0.000	0.000	-	0.000
Current President's Budget	0.000	0.000	51.340	-	51.340
Total Adjustments	0.000	0.000	51.340	-	51.340
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Transfer from Program Element 0604165D8Z	-	-	52.000	-	52.000
• Program Adjustments	-	-	-0.660	-	-0.660

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603183D8Z *I Joint Hypersonic Technology Development & Transition*

Change Summary Explanation

FY 2022 funding transfer from the Prompt Global Strike Capability Development Program Element (0604165D8Z), Project code 065, Joint Hypersonics, is to better align the hypersonic mission and budget activity with the congressional intent.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603183D8Z / *Joint Hypersonic Technology Development & Transition*	Project (Number/Name) 066 / *Joint Hypersonic Transition Office (JHTO)*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
066: *Joint Hypersonic Transition Office (JHTO)*	-	0.000	0.000	51.340	-	51.340	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

The Joint Hypersonics Transition Office (JHTO) is not a new start, but was created in FY 2020 as a result of a Congressional add that highlighted the threats to national security posed by hypersonic weapons and the need to better synchronize hypersonic technology development and workforce development. The JHTO transfers from the Prompt Global Strike Capability Development Program Element (0604165D8Z), Project code 065, Joint Hypersonics, to JHTO is to better align the hypersonic mission and budget activity with the congressional intent.

A. Mission Description and Budget Item Justification

The Joint Hypersonics Transition Office (JHTO) within the Office of the Under Secretary of Defense for Research and Engineering (OUSD(R&E) was created to establish a university consortium for hypersonics research and support workforce development; expedite testing, evaluation, and acquisition of hypersonic technologies to meet the stated needs of the warfighter, including flight testing, ground-based-testing, and underwater launch testing; ensure that prototyping demonstration programs on hypersonic systems integrate advanced technologies to speed the maturation and deployment of future hypersonic systems; develop strategies and roadmaps for hypersonic technologies to enable the transition of such technologies to future operational capabilities for the warfighter; and develop and implement a strategy for enhancing the current and future hypersonics workforce.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: University Consortium for Applied Hypersonics	0.000	-	22.840
Description: The JHTO established the University Consortium for Applied Hypersonics and plans to solicit research projects through the Consortium that address priorities and gaps identified by the JHTO Hypersonics Science and Technology (S&T) Roadmap, focusing on workforce development, applied research and advanced technology development related to the hypersonics mission. To facilitate development of the next generation hypersonics workforce, the JHTO intends to leverage the Consortium to award scholarships to graduate students who are focusing on key hypersonic development areas. Additionally, the Consortium will host Consortium Industry Days, Project Industry Days, and participate in career/internship fairs to cross-level information and enhance workforce development. ***FY 2022 Plans:*** The JHTO plans to solicit research projects through the Consortium that address priorities and gaps identified by the JHTO Hypersonics Science and Technology (S&T) Roadmap, focusing on workforce development, applied research and advanced technology development related to the hypersonics mission. To facilitate development of the next generation hypersonics workforce, the JHTO intends to leverage the Consortium to award scholarships to graduate students who are focusing on key			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603183D8Z / *Joint Hypersonic Technology Development & Transition*	**Project (Number/Name)** 066 / *Joint Hypersonic Transition Office (JHTO)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
hypersonic development areas. Additionally, the Consortium will host Consortium Industry Days, Project Industry Days, and participate in career/internship fairs to cross-level information and enhance workforce development. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Funding is transferred from the Prompt Global Strike Capability Development Program Element (0604165D8Z) Project code 065, Joint Hypersonics.			
Title: Navigation, Guidance and Controls (NGC) Science and Technology Development ***Description:*** In alignment with the jointly-developed Hypersonics S&T Roadmap, the JHTO funds NGC science and technology projects to improve the operational capabilities of both offensive and defensive hypersonic systems. These projects focus on navigation in contested environments, on-vehicle trajectory generation, communications risk reduction, guidance electronics, and conformal antenna development. Additional details regarding these projects are sensitive and/or classified and will be provided upon request. ***FY 2022 Plans:*** Continue activities initiated under the Prompt Global Strike Capability Development Program Element (0604165D8Z) Project code 065, Joint Hypersonics. Additional details regarding FY 2022 NGC projects are sensitive and/or classified and will be provided upon request. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Funding is transferred from the Prompt Global Strike Capability Development Program Element (0604165D8Z) Project code 065, Joint Hypersonics.	0.000	-	6.200
Title: Propulsion Science and Technology Development ***Description:*** In alignment with the jointly-developed Hypersonics S&T Roadmap, the JHTO funds propulsion science and technology projects designed to enhance propulsion capabilities for both offensive and defensive hypersonic systems. These efforts will close critical gaps in the development of hypersonic cruise missiles and enhance range and/or payload capacity of boost-glide systems. Focus areas for these projects include solid rocket motor component technologies, expanding the operating envelope of Dual-Mode Ramjet/Scramjet propulsion systems, developing new actuator technologies for axial thrusters, and establishing a proof-of-principle for an improved endothermic fuel for hypersonic applications. Additional details regarding these projects are sensitive and/or classified and will be provided upon request. ***FY 2022 Plans:***	0.000	-	3.832

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603183D8Z / *Joint Hypersonic Technology Development & Transition*	**Project (Number/Name)** 066 / *Joint Hypersonic Transition Office (JHTO)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Continue activities initiated under the Prompt Global Strike Capability Development Program Element (0604165D8Z) Project code 065, Joint Hypersonics. Additional details regarding FY 2022 propulsion projects are sensitive and/or classified and will be provided upon request. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Funding is transferred from the Prompt Global Strike Capability Development Program Element (0604165D8Z) Project code 065, Joint Hypersonics.			
Title: Systems Engineering, Design and Analysis (SEDA) Science and Technology Development ***Description:*** In alignment with the jointly-developed Hypersonics S&T Roadmap, the JHTO funds SEDA science and technology projects designed to: (1) improve the modeling and prediction of hypersonic vehicle plumes, wakes, and signatures, and (2) provide performance baselines for offensive and defensive systems. Additional details are sensitive and/or classified and will be provided upon request. ***FY 2022 Plans:*** Continue activities initiated under the Prompt Global Strike Capability Development Program Element (0604165D8Z) Project code 065, Joint Hypersonics. Additional details regarding FY 2022 SEDA projects are sensitive and/or classified and will be provided upon request. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Funding is transferred from the Prompt Global Strike Capability Development Program Element (0604165D8Z) Project code 065, Joint Hypersonics.	0.000	-	1.600
Title: Materials, Structures and Manufacturing (MSM) Science and Technology Development ***Description:*** In alignment with the jointly-developed Hypersonics S&T Roadmap, the JHTO funds MSM science and technology projects essential to develop new high-temperature materials for hypersonic applications and to design more efficient and effective manufacturing methods for hypersonic structural components. Specific projects seek to characterize alternative ceramic matrix composites for hypersonics, improve the ability to produce multiphase monolithic ceramic dielectric materials, test and characterize the performance of leading edge coatings, and improve manufacturing processes to build cruiser fins. Additional details regarding these projects are sensitive and/or classified and will be provided upon request. ***FY 2022 Plans:***	0.000	-	1.800

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603183D8Z / *Joint Hypersonic Technology Development & Transition*	**Project (Number/Name)** 066 / *Joint Hypersonic Transition Office (JHTO)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Continue activities initiated under the Prompt Global Strike Capability Development Program Element (0604165D8Z) Project code 065, Joint Hypersonics. Additional details regarding FY 2022 MSM projects are sensitive and/or classified and will be provided upon request. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Funding is transferred from the Prompt Global Strike Capability Development Program Element (0604165D8Z) Project code 065, Joint Hypersonics.			
Title: Ordnance Science and Technology Development ***Description:*** In alignment with the jointly-developed Hypersonics S&T Roadmap, the JHTO funds ordnance science and technology projects to better understand hypersonic ordnance effects and improve those effects across a broad range of target sets. Projects will develop and demonstrate a survivable fuze system designed to function under extreme hypersonic terminal conditions, model shock loads associated with a multi-mission warhead, and conduct high-fidelity modeling to analyze and optimize the effects of hypersonic munitions. Additional details regarding these projects are sensitive and/or classified and will be provided upon request. ***FY 2022 Plans:*** Continue activities initiated under the Prompt Global Strike Capability Development Program Element (0604165D8Z) Project code 065, Joint Hypersonics. Additional details regarding FY 2022 Ordnance projects are sensitive and/or classified and will be provided upon request. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Funding is transferred from the Prompt Global Strike Capability Development Program Element (0604165D8Z) Project code 065, Joint Hypersonics.	0.000	-	3.200
Title: Mission Planning Science and Technology Development ***Description:*** In alignment with the jointly-developed Hypersonics S&T Roadmap, the JHTO funds mission planning science and technology projects to support rapid mission planning of hypersonic systems when employed in a variety of operational conditions. Projects focus on flight-trajectory survivability analysis, the development of prototype tools to facilitate rapid mission planning, and the assessment of weather impacts during different segments of hypersonic flight. Additional details regarding these projects are sensitive and/or classified and will be provided upon request. ***FY 2022 Plans:***	0.000	-	1.218

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603183D8Z / *Joint Hypersonic Technology Development & Transition*	**Project (Number/Name)** 066 / *Joint Hypersonic Transition Office (JHTO)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Continue activities initiated under the Prompt Global Strike Capability Development Program Element (0604165D8Z) Project code 065, Joint Hypersonics. Additional details regarding FY 2022 Mission Planning projects are sensitive and/or classified and will be provided upon request. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Funding is transferred from the Prompt Global Strike Capability Development Program Element (0604165D8Z) Project code 065, Joint Hypersonics.			
Title: Aerodynamics and Aerothermodynamics Science and Technology Development ***Description:*** In alignment with the jointly-developed Hypersonics S&T Roadmap, the JHTO funds aerodynamics and aerothermal science and technology project to enhance aero optics modeling and simulation testing. This project seeks to increase the fidelity of infrared aero optics modeling and simulation data while driving down man-hours through creation/validation of a more useful and collaborative collection format. Additional details are sensitive and/or classified and will be provided upon request. ***FY 2022 Plans:*** Continue activities initiated under the Prompt Global Strike Capability Development Program Element (0604165D8Z) Project code 065, Joint Hypersonics. Additional details regarding FY 2022 aerodynamics and aerothermal science and technology projects are sensitive and/or classified and will be provided upon request. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Funding is transferred from the Prompt Global Strike Capability Development Program Element (0604165D8Z) Project code 065, Joint Hypersonics.	0.000	-	1.700
Title: Tactical High-speed Offensive Ramjet for Extended Range (THOR-ER) ***Description:*** In FY 2022, THOR-ER transitioned from Program Element 0603338D8Z Defense Modernization and Prototyping. The THOR-ER project will develop and demonstrate a full-scale missile prototype incorporating advanced solid fuel ramjet technologies, culminating in a series of operationally relevant flight demonstrations. THOR-ER enables leap-ahead gains in missile range and cruise speed while maintaining form factors similar to currently-fielded solid-rocket motor systems. Technology developed as part of the THOR-ER project will enhance the affordability and survivability of next generation weapon systems. THOR-ER is a co-development effort partnering with the U.S. Navy Naval Air Warfare Center, Weapons Division China Lake; the Norwegian Defence Research Establishment; and, the Norwegian industrial base partner, Nammo. ***FY 2022 Plans:***	0.000	-	1.400

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603183D8Z / *Joint Hypersonic Technology Development & Transition*	**Project (Number/Name)** 066 / *Joint Hypersonic Transition Office (JHTO)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
In FY 2022, flight testing of the full-scale missile prototypes will commence followed by an iterative series of flight test and prototype refinement phases through FY 2024. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** In FY 2022, funding increases due to increased costs associated with full-scale prototype flight testing.			
Title: JHTO Manpower, Support and Administration ***Description:*** Supports all JHTO activities to include financial oversight, Hypersonic S&T Roadmap Development; competitive award of the University Consortium for Applied Hypersonics, competitive award of University Grants; administrative efforts associated with all S&T project funding, and general administrative support for conferences and reporting. Planned and obligated funding covers support contracts, support provided through the Johns Hopkins University Applied Physics Laboratory, and funding reserved to potentially establish a JHTO field office. ***FY 2022 Plans:*** Continue to support all JHTO activities, to include financial oversight, Hypersonic S&T Roadmap Development; oversight of the University Consortium for Applied Hypersonics; administrative efforts associated with all S&T project funding, and general administrative support for conferences and reporting. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Funding is transferred from the Prompt Global Strike Capability Development Program Element (0604165D8Z) Project code 065, Joint Hypersonics.	0.000	-	2.865
Title: JHTO Systems Engineering Field Activity at NSWC Crane ***Description:*** Supports systems engineering and integration for hypersonics development to generate efficiencies and facilitate technology transition. Support will include coordinating with systems engineering teams across the Services and programs; negotiating more modular Government Reference Architectures to support individual programs; define and execute system on-ramping plans, primarily; and guide accelerated development plans. Additionally, the activity will represent the JHTO as a technical execution area co-lead for workforce development. ***FY 2022 Plans:*** Continue to support cross-service systems engineering, technology transition, and workforce development. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Funding is transferred from the Prompt Global Strike Capability Development Program Element (0604165D8Z) Project code 065, Joint Hypersonics.	0.000	-	4.685
Accomplishments/Planned Programs Subtotals	0.000	-	51.340

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603183D8Z / *Joint Hypersonic Technology Development & Transition*	**Project (Number/Name)** 066 / *Joint Hypersonic Transition Office (JHTO)*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

THIS PAGE INTENTIONALLY LEFT BLANK

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603225D8Z *I Joint DOD/DOE Munitions Technology Development*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	-	18.681	18.861	19.063	-	19.063	-	-	-	-	-	-
225: *Joint DOD/DOE Munitions*	-	18.681	18.861	19.063	-	19.063	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

The Department of Defense (DoD)/Department of Energy (DOE) Joint Munitions Technology Development Program (JMP) enables military superiority by setting and driving the critical path for cutting-edge capability-driven munitions science and technology (S&T) to equip the Joint Force for the future fight. The JMP portfolio comprises essential cross-cutting and foundational S&T investments that enable Future Force operational capabilities in the near, mid, and far term. In setting the technical direction for the DoD, the Joint DoD/DOE Munitions Program performs S&T to advance the state of the art for non-nuclear munitions technology in the focus areas of decision tools, delivery, munition controls, lethal effects, and readiness.

A Memorandum of Understanding signed in 1985 by the DoD and DOE provides the basis for the cooperative effort. Through this interdepartmental cooperation and joint investment (DOE matches the DoD's investment at 1:1), DoD leverages the DOE's substantial investments in intellectual capital and highly specialized skills, advanced scientific equipment and facilities, and computational tools not available within the DoD, bolstering good stewardship of taxpayer dollars. The portfolio is monitored by a panel of Tri-Service Senior Executive Service-nominated subject matter experts who conduct rigorous technical and programmatic review to prioritize essential investments. The technology, resources, and capabilities return for DoD in this program is estimated at two to three times its investment.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	18.773	18.873	19.285	-	19.285
Current President's Budget	18.681	18.861	19.063	-	19.063
Total Adjustments	-0.092	-0.012	-0.222	-	-0.222
• Congressional General Reductions	-	-0.012			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.089	-			
• Program Adjustment	-	-	-0.222	-	-0.222
• Cancelled Amount	-0.003	-	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603225D8Z / *Joint DOD/DOE Munitions Technology Development*	Project (Number/Name) 225 / *Joint DOD/DOE Munitions*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
225: *Joint DOD/DOE Munitions*	-	18.681	18.861	19.063	-	19.063	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Projects within the JMP portfolio enable capability advancements in: higher speed and hypersonic delivery, counter unmanned aerial systems, microelectronics, longer range precision effects, networked and collaborative systems of systems, agility at the engagement level, logistics in contested environments, increased capacity/ affordable mass, survivability during deployment and target engagement, rapid technology refreshes/adaptation to changing threats, post-launch re-programming, open systems architectures, and weapon cyber-resiliency. JMP investments may be leverageable for nuclear deterrence, space, quantum science, and 5G, but the portfolio does not specifically focus on these capability areas.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Joint DoD/DOE Munitions Technology Development	18.681	18.861	19.063

Description: DoD/DOE Munitions Technology Development focuses on the following key areas: (1) the development of in silico decision tools for munition design and in-theater function; (2) innovation of munitions delivery technology to include weapon bodies, propulsion systems, propellants, and environment/target hardening; (3) development of state-of-the-art munition controls for fuzing, microelectronics, power, sensors, kill chains, and survivable components; (4) design of lethal effects through explosive, formulation, warhead, and target damage innovations; and (5) development and transition of decisive readiness technology for munitions through the full munitions lifecycle (design through end-of-life). The JMP organized accordingly with five Technical Coordinating Groups (TCGs), Decision Tools, Delivery, Munition Controls, Lethal Effects, and Readiness.

FY 2021 Plans:

In FY 2021 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.

• 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.
• TCG 2 – Delivery will develop processing techniques for high performance and robust materials to inform high speed and hypersonic system development efforts.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603225D8Z / *Joint DOD/DOE Munitions Technology Development*	**Project (Number/Name)** 225 / *Joint DOD/DOE Munitions*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
• 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 increased thermal stability, mechanical survivability, and intelligent fuzing/firing response time, and develop new sensors (GPS-denied environments, proximity sensors) for extreme environments. • 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. • TCG 5 – Readiness will evaluate and quantify COTS device reliability studies to inform in-use and storage readiness for hypersonic components			
FY 2022 Plans: In FY 2022, the portfolio will address priority DoD S&T capability advancements and leverages DOE investment. • The Decision Tools focus area will a) employ machine learning code development to support lethality assessments/ weaponeering models, b) accelerate decision tool codes with faster processing, c) demonstrate improved munitions and subsystems modeling and simulation in complex shock environments, and d) deliver improved material model packages for hard and deeply buried targets. • The Delivery focus area will: a) deliver integrated warhead cases for high speed perforation/penetration into buildings, light bunkers, and maritime targets, and b) fabricate and test materials for hypersonics. • Munition Controls will a) demonstrate design improvement for a novel supercapacitor, b) optimize explosive-train design in the presence of competing system requirements, c) deliver a transformer component in a relevant form factor, d) demonstrate survivability of a capacitor for miniaturized fuzing, e) demonstrate development of a component for hardened electronic, verify a GPS-denied navigation solution, and f) advance and transition sensor technology battery innovations. • Lethal Effects will a) demonstrate explosive volume reduction using additive manufacturing, b) demonstrate increase in kinetic energy for an additively manufactured subsystem, c) deliver a characterization dataset for novel energetics, d) predict effects of gun launch on energetics, e) validate materials and diagnostics for improved energetics, f) deliver a database for warhead materials, g) improve energetic systems performance, h) deliver a model to predict temperature effects on lethal systems, i) validate an arena-test alternative, and j) produce a dataset for enhanced target damage. • Readiness will: a) baseline additively manufactured parts for qualification standards, b) deliver test method for a power system failure mode analysis, and c) identify mechanism for adhesive failures in components.			
FY 2021 to FY 2022 Increase/Decrease Statement:			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603225D8Z / *Joint DOD/DOE Munitions Technology Development*	**Project (Number/Name)** 225 / *Joint DOD/DOE Munitions*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Changes reflect minor budget fluctuation.			
Accomplishments/Planned Programs Subtotals	18.681	18.861	19.063

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603288D8Z / *Science and Technology (S&T) Analytic Assessments*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	69.473	17.807	19.775	24.012	-	24.012	-	-	-	-	-	-
328: *Science and Technology Analytic Assessments*	69.473	17.807	13.030	17.259	-	17.259	-	-	-	-	-	-
177: *Technology Watch/Horizon Scanning*	0.000	0.000	6.745	6.753	-	6.753	-	-	-	-	-	-

Note

The Technology Watch/Horizon Scanning efforts under Project code 177 were previously aligned under Program Element 0602234D8Z, Project code 535 (Office of Technical Intelligence). Effective 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.

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)) that focuses on understanding the capabilities and vulnerabilities of potential adversaries, assessing U.S. capabilities, tracking global technology trends, assessing emerging threats, and identifying potential opportunities that warrant action and investment. The analysis performed in the PE uses the operational context of Joint and cross-domain missions by leveraging Combatant Commands (CCMD) and Joint Staff (JS) warfighting concepts. Throughout this process the analysis will be tightly coupled with both the Intelligence community (IC) and the operational community through the JS. Global science and technology (S&T) awareness and context is gained and incorporated through the Technology Watch/Horizon Scanning (TW/HS) project, and combined with operational and technical analyses, integrates 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 National Defense Strategy (NDS) objectives and adversary research and development trends. Four analysis methods are used:

1) Technology Watch/Horizon Scanning identifies and contextualizes emerging technology areas and trends to inform potential investment areas for rapid capability development;
2) Operational Assessments integrate information from the acquisition, intelligence, operational, and technical communities to explore threats and opportunities in the future operating environment through wargames and characterizations.
3) Technical Analysis quantifies key attributes of the challenge, assesses counter technology options, provides an operational value assessment, and provides net technical analysis on emerging challenges and threats using the Federally Funded Research and Development Center/University Affiliated Research Center (FFRDC/UARC) community as performers while leveraging pervious related experience and work completed for the Department of Defense (DoD); and
4) Technology wargames identify opportunities stemming from emerging technologies; evaluate the demands of the future operational environment; and integrate the operational, technology, and intelligence communities across the DoD and IC.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603288D8Z *I Science and Technology (S&T) Analytic Assessments*

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 support will provide a bridge between the IC and the OUSD(R&E) enterprise to access the most relevant intelligence analysis and coordinate integration of intelligence with capability development 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 with a formal understanding of intelligence requirements in the S&T community.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	18.429	23.775	24.353	-	24.353
Current President's Budget	17.807	19.775	24.012	-	24.012
Total Adjustments	-0.622	-4.000	-0.341	-	-0.341
• Congressional General Reductions	-	-4.000			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.619	-			
• Program Adjustments	-0.003	-	-0.341	-	-0.341

Change Summary Explanation

FY 2020: SBIR/STTR Transfer and component level reductions.
FY 2021: Congressional reduction of $4.000 million due to prior year carryover.
FY 2022: Economic Assumption Reductions.
In FY 2021, internal realignments include a transfer of funds from PE 0602234D8Z Project code 535 (Technical Intelligence) to the Technology Watch/Horizon Scanning 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.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603288D8Z / *Science and Technology (S&T) Analytic Assessments*	Project (Number/Name) 328 / *Science and Technology Analytic Assessments*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
328: *Science and Technology Analytic Assessments*	69.473	17.807	13.030	17.259	-	17.259	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Science and Technology (S&T) Analytic Assessments Program Element (PE) shapes the development of innovative capabilities to address emerging threats from a diverse range of state and non-state actors as outlined in the NDS. 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 Assessments identify prioritized operational issues and associated actionable technology focus areas. These assessments help shape technology investment decisions and inform the strategic direction of capability development. Characterizations of future operating environments and associated challenges inform the scoping and design efforts of mission engineering and mission integration analyses for OUSD(R&E). Because of the future-oriented 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:
- Produce detailed characterizations of U.S. and adversary capabilities and technology development efforts. This data enables mission-oriented analysis of emerging threats.
- Produce operational impact assessments of potential technology improvements to future military capabilities.
- Produce standardized technology-focused timelines to summarize and track DoD progress toward technical dominance in priority technology areas.
- Produce Operational Environment Packages that characterize the future operational environment through integration of strategy, doctrine, policy, concepts, technology, and intelligence to provide a common analytic baseline for examining technologies, capabilities, gaps, and opportunities.

Technical Analysis is performed by DoD-sponsored FFRDC/UARC performers and Department of Defense and Department of Energy (DoD/DoE) laboratories. Main lines of effort include:
- Technical threat assessments informed by IC products for identifying gaps in U.S. capability for critical threats.
- Quantitative, engineering-level analysis of potential novel technology and concepts to address capability gaps and counter emerging threat technologies in future environments.
- Independent assessment of U.S. and potential adversary critical capability and technology development.
- Net technical assessment of existing and planned U.S. capabilities and weapons systems using emerging threat systems and capabilities in future operating environments.

Technology wargames identify opportunities stemming from emerging technologies, evaluate the demands of the future operational environment, and integrate the operational, technology, and intelligence communities. Wargame outputs inform future concept and capability development, prototyping and experimentation activities, threat forecasting, and DoD S&T investments. Main lines of effort include:

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603288D8Z / *Science and Technology (S&T) Analytic Assessments*	**Project (Number/Name)** 328 / *Science and Technology Analytic Assessments*

- Execution of Emerging Disruptive Technology (EDT) Wargames to inform and better align Joint Warfighting Concept development and DoD modernization activities.

SIAC funding of modeling, simulation, and analysis (M&SA) computer-based engineering models is concluded as of FY 2021. Development and integration efforts previously funded by this PE have transitioned to a self-sustaining and externally funded structure, as the tools are further matured and will be operated based on end-user needs.

An increased level of effort is directed towards developing and delivering operational baselines that support mission engineering/mission integration efforts of the OUSD(R&E), beginning FY 2021 and continuing in FY 2022. Operational baselines and wargames will continue to be more frequently incorporated into a wider scope of mission-level analytic design conducted by OUSD(R&E), and the mission emphasis of these activities has been adjusted to meet current and future needs.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Science and Technology Analytic Assessments	17.807	13.030	17.259

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 National Defense Strategy and the National Military Strategy. Throughout this process the analysis will be tightly coupled with both the IC and the operational community through the Combatant Commands.

Accordingly, the following activities are planned for FY 2021 and FY 2022:

FY 2021 Plans:
Operational and Technical Assessments:
- Produce and update foundational data of U.S. and adversary capabilities to enable mission-oriented analysis of emerging threats.
- Assess emerging operational scenarios against future Red and Blue capability timelines.
- Produce Operational Environment Packages to characterize the future Joint Force operational environment to provide a common analytic baseline for assessing future Red and Blue capabilities and asymmetries.

Technical Analysis:
- Produce technical threat assessments informed by IC products for identifying gaps in U.S. capability for critical threats.
- Conduct analysis of potential novel technology and concepts to address capability gaps and counter emerging threat technologies in future environments.
- Conduct independent assessment of U.S. and potential adversary critical capability and technology development.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603288D8Z / *Science and Technology (S&T) Analytic Assessments*	**Project (Number/Name)** 328 / *Science and Technology Analytic Assessments*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
- Conduct net technical assessment of existing and planned U.S. capabilities and weapons systems using emerging threat systems and capabilities in future operating environments. Planned technology areas include quantum, bioengineering, microelectronics, directed energy, hypersonics, and artificial intelligence/machine learning. - Conduct technology maturation analysis to improve Horizon Scanning methodologies and processes while informing technology superiority comparison efforts that identify critical emerging technology opportunities for capability overmatch. Technology Wargames: - Conduct Emerging Disruptive Technology (EDT) wargames to inform and better align DoD Modernization activities, joint concept and capability development, and threat forecasting. Specific topics will be selected based on SIAC and OUSD(R&E) analytic priorities. Produce an annual S&T Intelligence Needs Plan providing the IC with a formal understanding of intelligence requirements in the S&T community.			
FY 2022 Plans: Operational and Technical Assessments: - Produce and update foundational data of U.S. and adversary capabilities to enable mission-oriented analysis of emerging threats. - Assess emerging operational scenarios against future Red and Blue capability timelines. - Produce Operational Environment Packages to characterize the future Joint Force operational environment to provide a common analytic baseline for assessing future Red and Blue capabilities and asymmetries. Technical Analysis: - Conduct technical threat assessments informed by IC products for identifying gaps in U.S. capability for critical threats. - Conduct analysis of potential novel technology and concepts to address capability gaps and counter emerging threat technologies in future environments. - Conduct independent assessment of U.S. and potential adversary critical capability and technology development. - Produce net technical assessments of existing and planned U.S. capabilities and weapons systems using emerging threat systems and capabilities in future operating environments. Planned technology areas include fully-networked command, control, and communications, 5G, autonomy, cyber, and space. - Conduct technology maturation analysis to improve Horizon Scanning methodologies and processes while informing technology superiority comparison efforts that identify critical emerging technology opportunities for capability overmatch. Technology Wargames:			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603288D8Z / *Science and Technology (S&T) Analytic Assessments*	**Project (Number/Name)** 328 / *Science and Technology Analytic Assessments*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
- Conduct Emerging Disruptive Technology (EDT) wargames to inform and better align DoD Modernization activities, joint concept and capability development, and threat forecasting. Specific topics will be selected based on SIAC and OUSD(R&E) analytic priorities. Produce an annual S&T Intelligence Needs Plan providing the IC with a formal understanding of intelligence requirements in the S&T community. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The FY 2021 funding request was reduced by $4 million to account for the availability of prior year execution balances.			
Accomplishments/Planned Programs Subtotals	17.807	13.030	17.259

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603288D8Z / *Science and Technology (S&T) Analytic Assessments*	Project (Number/Name) 177 / *Technology Watch/Horizon Scanning*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
177: *Technology Watch/Horizon Scanning*	0.000	0.000	6.745	6.753	-	6.753	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In FY 2021, the Technology Watch/Horizon Scanning efforts were previously aligned under Program Element 0602234D8Z Project code 535 (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 Scanning Program supports emerging technology characterization through the identification of technology research trends and the forecasting of future concepts and technologies exhibiting high growth with potential for military application for the 2035-2040 timeline. Primary objectives are to:
- Identify and contextualize critical and emerging technology (C&ET) with potential military applications for the DoD; and
- 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, the program's end-state is to inform the Department's investment decisions 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 2020	FY 2021	FY 2022
Title: Technology Watch/Horizon Scanning	0.000	6.745	6.753
Description: The program utilizes 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 2021 Plans: In FY 2021, the TW/HS program will identify and contextualize emerging technology areas and trends to inform potential investment areas for rapid capability development. - 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. - Conduct two technology Horizon Scans to identify and track global technology trends. - Deliver annual C&ET trend report.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603288D8Z / *Science and Technology (S&T) Analytic Assessments*	**Project (Number/Name)** 177 / *Technology Watch/Horizon Scanning*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
- Conduct technology scouting of government, academia, and industry C&ET events, to track development and maintain awareness of technology trends, delivering reports and monthly S&T newsletters the USD(R&E) enterprise. ***FY 2022 Plans:*** In FY 2022, the TW/HS program will continue to identify and contextualize emerging technology areas and trends to inform potential investment areas for rapid capability development. - Continue to operate and improve data analytics tool. - 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. - Conduct two technology Horizon Scans identify and track global technology trends. - Deliver annual C&ET trend report. - Conduct technology scouting of government, academia, and industry C&ET events, to track development and maintain awareness of technology trends, deliver reports and monthly S&T newsletters to the USD(R&E) enterprise. - Leverage technology maturation analysis to enhance Horizon Scan algorithms to produce more improve technology landscape forecasting. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Changes reflect minor budget fluctuations.			
Accomplishments/Planned Programs Subtotals	0.000	6.745	6.753

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 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603289D8Z *I Advanced Innovative Analysis and Concepts*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	226.419	36.801	28.524	51.513	-	51.513	-	-	-	-	-	-
329: *Advanced Innovative Analysis and Concepts*	226.419	36.801	28.524	51.513	-	51.513	-	-	-	-	-	-

Note

In FY 2022, funds were re-aligned from PE 0603291D8Z since both program elements fund the same efforts.

A. Mission Description and Budget Item Justification

The Strategic Capabilities Office (SCO) conducts analysis to identify and accelerate the development, demonstration, and transition of game-changing capabilities to shape and counter emerging threats and 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, study, and analysis 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. This Program Element also supports the development of concept proposals for assessment by the Technical and Transition Cross Functional Teams established in accordance with the FY 2021 National Defense Authorization Act for full development under the Advanced Innovative Technologies Program Element. 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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	37.645	36.524	37.788	-	37.788
Current President's Budget	36.801	28.524	51.513	-	51.513
Total Adjustments	-0.844	-8.000	13.725	-	13.725
• Congressional General Reductions	-	-8.000			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-0.006	-			
• SBIR/STTR Transfer	-0.838	-			
• Re-alignment from PE 0603291D8Z	-	-	13.725	-	13.725

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603289D8Z / *Advanced Innovative Analysis and Concepts*	Project (Number/Name) 329 / *Advanced Innovative Analysis and Concepts*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
329: *Advanced Innovative Analysis and Concepts*	226.419	36.801	28.524	51.513	-	51.513	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

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 new concepts. 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 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, study, and analysis 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 2020	FY 2021	FY 2022
Title: Innovative Analysis and Concept Generation	7.365	13.549	26.513
Description: The Strategic Capabilities Office conducts analysis, studies, demonstrations of integrated concepts and prototypes, component and subsystem maturation, and risk-reduction demonstrations in support of ongoing efforts to shape and counter emerging threats, and develops project proposals for prototyping under the Advanced Innovative Technologies Program Element. Due to the nature of these projects, specific applications and detailed plans are available at a higher classification level. ***FY 2021 Plans:*** Continue to innovate in partnership with Services Program Offices and CCMDs to identify game-changing uses of existing and mature systems and technologies. ***FY 2022 Plans:*** Continue to innovate in partnership with Services Program Offices and CCMDs to identify game-changing uses of existing and mature systems and technologies. ***FY 2021 to FY 2022 Increase/Decrease Statement:***			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603289D8Z / *Advanced Innovative Analysis and Concepts*	**Project (Number/Name)** 329 / *Advanced Innovative Analysis and Concepts*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
FY 2021 to FY 2022 increase is due to the transfer of FY 2022 and out-year funds from PE 0603291D8Z, since both program elements perform the same function.			
Title: Quick Win Projects ***Description:*** With the establishment of level funding for the Strategic Capabilities Office, and the creation of the Cross Functional Teams to evaluate candidate concepts, the Advanced Innovation Analysis and Concepts Program Element will increase focus on analysis, risk reduction, and formulation for promising future concepts as part of a renewed focus on formulation and risk reduction. ***FY 2021 Plans:*** Complete Quick Win projects started in FY 2020. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2021 to FY 2022 decrease is the result of elimination of a separate Quick Wins program line.	19.648	0.625	-
Title: Formulation and Risk Reduction ***Description:*** Subsequent to review and recommendation of project concepts by the new Technical and Transition Cross Functional Teams, the Strategic Capabilities Office performs engineering trade studies and conducts component tests to prepare selected projects to be ready to enter into full prototype development under the Advanced Innovative Technologies Program Element. Activities, such as proving component and subsystem maturity prior to integration in major systems, are intended to finalize key requirements to reduce technical risk during prototype development. Due to the nature of these projects, specific applications and detailed plans are available at a higher classification level. ***FY 2021 Plans:*** Conduct formulation and risk reduction for projects proposed to begin in FY 2022. ***FY 2022 Plans:*** Conduct formulation and risk reduction for projects proposed to begin in FY 2023. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The budget increase is required to support the larger number of projects budgeted to begin in FY 2023.	9.788	14.350	25.000
Accomplishments/Planned Programs Subtotals	36.801	28.524	51.513

C. Other Program Funding Summary ($ in Millions)

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603289D8Z / *Advanced Innovative Analysis and Concepts*	**Project (Number/Name)** 329 / *Advanced Innovative Analysis and Concepts*

C. Other Program Funding Summary ($ in Millions)

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603291D8Z / *Advanced Innovative Analysis & Concepts - MHA*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	28.256	14.339	14.703	0.000	-	0.000	-	-	-	-	-	-
251: *SCO Operational Costs*	28.256	14.339	14.703	0.000	-	0.000	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

The Strategic Capabilities Office (SCO) conducts analysis to identify and accelerate the development, demonstration, and transition of game-changing capabilities to shape and counter emerging threats and 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 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. This Program Element also supports the development of concept proposals for assessment by the Technical and Transition Cross Functional Teams established in accordance with the FY 2021 National Defense Authorization Act for full development under the Advanced Innovative Technologies Program Element. 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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	14.668	14.703	14.209	-	14.209
Current President's Budget	14.339	14.703	0.000	-	0.000
Total Adjustments	-0.329	0.000	-14.209	-	-14.209
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Realigned Funding to PE 0603289D8Z	-	-	-14.209	-	-14.209
• Program Adjustment	-0.329	-	-	-	-

Change Summary Explanation

Funds have been transferred to PE 0603289D8Z in FY 2022.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603291D8Z / *Advanced Innovative Analysis & Concepts - MHA*	Project (Number/Name) 251 / *SCO Operational Costs*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
251: *SCO Operational Costs*	28.256	14.339	14.703	0.000	-	0.000	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Funds were transferred to PE 0603289D8Z in FY 2022.

A. Mission Description and Budget Item Justification

The Strategic Capabilities Office (SCO) conducts analysis to identify and accelerate the development, demonstration, and transition of game-changing capabilities to shape and counter emerging threats and 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 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. This Program Element also supports the development of concept proposals for assessment by the Technical and Transition Cross Functional Teams established in accordance with the FY 2021 National Defense Authorization Act for full development under the Advanced Innovative Technologies Program Element. 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 2020	FY 2021	FY 2022
Title: SCO Operational Costs - MHA	14.339	14.703	-
Description: The Strategic Capabilities Office (SCO) conducts analysis to identify and accelerate the development, demonstration, and transition of game-changing capabilities to shape and counter emerging threats and 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 of integrated concepts and prototypes, analysis in support of ongoing efforts to shape and counter emerging threats, cross-Service and cross-			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603291D8Z / *Advanced Innovative Analysis & Concepts - MHA*	**Project (Number/Name)** 251 / *SCO Operational Costs*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
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. This Program Element also supports the development of concept proposals for assessment by the Technical and Transition Cross Functional Teams established in accordance with the FY 2021 National Defense Authorization Act for full development under the Advanced Innovative Technologies Program Element. Due to the nature of these projects, specific applications and detailed plans are available at a higher classification level. ***FY 2021 Plans:*** This budget request supports development, studies, analysis 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. This Program Element also supports the development of concept proposals for assessment by the Technical and Transition Cross Functional Teams established in accordance with the FY 2021 National Defense Authorization Act for full development under the Advanced Innovative Technologies Program Element. Due to the nature of these projects, specific applications and detailed plans are available at a higher classification level. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Funding is realigned to PE 0603289D8Z, since both program elements fund the same efforts.			
Accomplishments/Planned Programs Subtotals	14.339	14.703	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

THIS PAGE INTENTIONALLY LEFT BLANK

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603338D8Z / *Defense Modernization and Prototyping*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	0.000	0.000	155.505	115.443	-	115.443	-	-	-	-	-	-
720: *Quick Reaction Special Projects (QRSP)*	0.000	0.000	57.478	49.408	-	49.408	-	-	-	-	-	-
721: *Emerging Capabilities Tech Dev (ECTD)*	0.000	0.000	76.345	66.035	-	66.035	-	-	-	-	-	-
722: *Time Sensitive Targeting Defeat (TSTD)*	0.000	0.000	10.002	0.000	-	0.000	-	-	-	-	-	-
723: *Red Teaming (RT)*	0.000	0.000	11.680	0.000	-	0.000	-	-	-	-	-	-

Note

Due to a database error, the FY 2021 project code funding amounts listed in the summary funding table above are not the correct values. The FY 2021 budget amounts will be executed by project code as follows:
$41.781 million - 720: Quick Reaction Special Projects (QRSP)
$89.852 million - 721: Emerging Capabilities Technology Development (ECTD)
$18.366 million - 722: Time Sensitive Targeting Defeat (TSTD)
$5.506 million - 723: Red Teaming (RT)
This error will be corrected for the President's Budget (PB) 2023.

The Defense Modernization and Prototyping (DM&P) Program Element (PE) will be adjusted to support the new priorities of the Under Secretary of Defense for Research and Engineering (USD(R&E)). In FY 2022, this realignment includes a transfer of funding in appropriate Time Sensitive Targeting Defeat (TSTD) project investment areas to Program Element 0603648D8Z Joint Capability Technology Demonstration (JCTD) for proper alignment and execution. As part of the PB 2023, all out year funding associated with the TSTD project code will transfer to Program Element 0603648D8Z.

In FY 2022, the Red Teaming project code will transition to a focus area under Project Code 721 Emerging Capabilities Technology Development (ECTD). As part of PB 2023, all out year funding associated with the Red Teaming project code will transition to a focus area under Project Code 721 ECTD.

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. Activities focus on early exploration of potentially game-changing emerging technologies and concepts; harnessing small and non-traditional business innovation to address Department of Defense (DoD) challenges; and, mid-term, mission-focused capability development of advanced systems to address DoD Modernization needs.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603338D8Z / *Defense Modernization and Prototyping*

Executed in partnership with the Services, Joint Staff, and Combatant Commands, DM&P programs increase the speed of innovation through the use of an uncharacteristic RDT&E execution model disbursing funding across the four fiscal quarters following receipt of the appropriation. With funds available throughout the year of execution, DM&P enables the USD(R&E) to nurture innovation from small businesses and non-traditional performers, and to accelerate emerging and disruptive technologies. Since program inception in 2006, this atypical execution model has enabled the Emerging Capabilities Technology Development (ECTD) and Quick Reaction Special Projects (QRSP) programs to successfully act as innovation engines for the DoD. This execution model causes the DM&P PE to lag traditional RDT&E PE obligation and execution benchmarks, however, since inception both the ECTD and QRSP programs have achieved an unbroken 100% obligation rate.

With an emphasis on joint and interagency partnerships, DM&P project selection is guided by Department-level strategies and priorities, such as the Joint Warfighting Concept, DoD Modernization priorities, the National Defense Strategy, and the Combatant Commands' Integrated Priority Lists (IPLs). New projects are selected with inputs from the Services and Agencies, the Joint Staff, the Combatant Commands, the Strategic Capabilities Office, the Defense Innovation Unit, and other organizations to deliver capabilities with the widest benefit to the joint warfighter, synchronize prototyping efforts across the DoD, and reduce duplication.

Leveraging innovative ideas from small business and non-traditional performers, academia, government labs, and the industrial base, DM&P funding supports risk-reducing joint prototyping, red teaming, experimentation, and demonstrations. ECTD prototyping projects increase the speed of technology innovation by reducing technology risk for emerging capabilities. ECTD prototyping, experimentation, and red teaming validations enable developers to showcase new and maturing capabilities. Exploring vulnerabilities in emerging technologies, ECTD red teaming activities enable the Department to make informed decisions early in capability development when design changes are cost effective and programs can be re-directed if developmental dead ends are discovered. QRSP prototypes, experiments, and demonstrations quickly explore new, higher-risk technology areas, by partnering with small and non-traditional businesses that have the potential for immediate, game-changing impacts. Due to the relatively low average cost of projects, QRSP is able to explore higher-risk opportunities with potentially higher reward.

Completed DM&P projects transition to joint programs and joint warfighters through early 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 operation (CONOPs).

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	133.375	133.107	-	133.107
Current President's Budget	0.000	155.505	115.443	-	115.443
Total Adjustments	0.000	22.130	-17.664	-	-17.664
• Congressional General Reductions	-	-0.068			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	22.198			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Program Adjustment	-	-	-17.664	-	-17.664

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603338D8Z / *Defense Modernization and Prototyping*

Congressional Add Details ($ in Millions, and Includes General Reductions)	**FY 2020**	**FY 2021**
Project: 721: *Emerging Capabilities Tech Dev (ECTD)*		
Congressional Add: *Emerging Capabilities Technology Support*	-	7.500
Congressional Add: *Air Base Resilience Sensor*	-	5.000
Congressional Add: *Open Source Intelligence*	-	3.000
Congressional Add: *Remote Advise and Assist (RAA) Technology Development*	-	8.000
Congressional Add: *Artificial Intelligence Enabled Sensor Network*	-	8.400
Congressional Add Subtotals for Project: 721	-	31.900
Project: 722: *Time Sensitive Targeting Defeat (TSTD)*		
Congressional Add: *Stratospheric Balloon Research*	-	10.000
Congressional Add Subtotals for Project: 722	-	10.000
Congressional Add Totals for all Projects	-	41.900

Change Summary Explanation

The FY 2021 increase for emerging capabilities technology support, disruptive air and missile defense, open source intelligence, remote advise and assist technology development, artificial intelligence enabled sensor network, and stratospheric balloon research.

The FY 2022 funding request was reduced by $1.701 million to account for the availability of prior year execution balances. Additional decrease due to internal realignment to Program Element 0603648D8Z Joint Capability Technology Demonstration (JCTD) for proper alignment and execution of the Time Sensitive Targeting Defeat (TSTD) focus area.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603338D8Z / *Defense Modernization and Prototyping*	Project (Number/Name) 720 / *Quick Reaction Special Projects (QRSP)*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
720: *Quick Reaction Special Projects (QRSP)*	0.000	0.000	57.478	49.408	-	49.408	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Due to a database error the FY 2021 funding amount reported in the summary funding table above for Project Code 720 Quick Reaction Special Projects (QRSP) is incorrect. The correct FY 2021 budget amount is $41.781 million. Net difference of $15.697M is aligned to Project Codes 721 Emerging Capabilities Technology Development (ECTD) and 722 Time Sensitive Targeting Defeat (TSTD) for execution. This error will be corrected for the President's Budget (PB) 2023.

A. Mission Description and Budget Item Justification

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. QRSP also enables the Department of Defense (DoD) to identify innovative solutions from small and non-traditional businesses not normally engaged by the DoD to address gaps and augment joint mission capabilities. This allows the DoD to quickly harness innovative solutions from outside the DoD by providing innovative small and non-traditional businesses the opportunity to engage with various government audiences on innovative solutions that could solve DoD challenges. Developed prototypes inform modernization efforts or transition through rapid technology refresh and insertion into 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. Individual projects generally span six to eighteen months and typically at a cost of less than $1.000 million.

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 fast 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.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Funding realignment to Project Code 721 Emerging Capabilities Technology Development (ECTD)	-	7.333	-
Description: Funding incorrectly reported in QRSP project code due to database error. Funding aligned to ECTD Conceptual Prototyping to Support DoD Modernization Priorities focus area.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603338D8Z / *Defense Modernization and Prototyping*	**Project (Number/Name)** 720 / *Quick Reaction Special Projects (QRSP)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
FY 2021 Plans: Funding realignment ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Funding realignment			
Title: Funding realignment to Project Code 722 Time Sensitive Targeting Defeat (TSTD) ***Description:*** Funding incorrectly reported in QRSP project code due to database error. Funding aligned to TSTD project code Time-Sensitive Target Defeat focus area ***FY 2021 Plans:*** Funding realignment ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Funding realignment	-	8.364	-
Title: Autonomy at the Tactical Edge Focus Area ***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 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. ***FY 2021 Plans:*** QRSP investment decisions are made during the execution year in response to Department of Defense (DoD), Combatant Command (CCMD), Service, and other government priorities. QRSP anticipates supporting three to eight projects in FY 2021. ***FY 2022 Plans:***	-	3.843	8.544

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603338D8Z / *Defense Modernization and Prototyping*	**Project (Number/Name)** 720 / *Quick Reaction Special Projects (QRSP)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
QRSP investment decisions are made during the execution year in response to DoD, CCMD, Service, and other government priorities. QRSP anticipates supporting nine to fourteen projects in FY 2022. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Funding for this focus area in FY 2022 increases to support acceleration of high priority autonomy prototyping efforts.			
Title: Targeted Prototyping for Increased Lethality and Survivability Focus Area ***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 to inform future acquisition programs. ***FY 2021 Plans:*** QRSP investment decisions are made during the execution year in response to DoD, CCMD, Service, and other government priorities. QRSP anticipates supporting seven to eleven projects in FY 2021. ***FY 2022 Plans:*** QRSP investment decisions are made during the execution year in response to DoD, CCMD, Service, and other government priorities. QRSP anticipates supporting seven to eleven projects in FY 2022. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Funding for this focus area in FY 2022 increases to support acceleration of high priority prototyping efforts.	-	7.093	7.719
Title: Persistent Intelligence, Surveillance and Reconnaissance (ISR) Focus Area ***Description:*** ISR sensor networks are critical for providing an asymmetric advantage 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 addresses 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 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.	-	3.712	7.398

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603338D8Z / *Defense Modernization and Prototyping*	**Project (Number/Name)** 720 / *Quick Reaction Special Projects (QRSP)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
FY 2021 Plans: QRSP investment decisions are made during the execution year in response to DoD, CCMD, Service, and other government priorities. QRSP anticipates supporting three to eight projects in FY 2021. ***FY 2022 Plans:*** QRSP investment decisions are made during the execution year in response to DoD, CCMD, Service, and other government priorities. QRSP anticipates supporting seven to twelve projects in FY 2022. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Funding for this focus area in FY 2022 increases to support acceleration of high priority persistent ISR prototyping efforts.			
Title: Realizing Disruptive Technologies for DoD Modernization Focus Area	-	8.030	8.324
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 capabilities to the warfighter and realize new disruptive technologies through low cost, rapid innovation within the development process of major system prototypes through the Strategic Capabilities Office, 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 prototypes, 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. ***FY 2021 Plans:*** QRSP investment decisions are made during the execution year in response to DoD, CCMD, Service, and other government priorities. QRSP anticipates supporting six to eleven projects in FY 2021. ***FY 2022 Plans:*** QRSP investment decisions are made during the execution year in response to DoD, CCMD, Service, and other government priorities. QRSP anticipates supporting six to eleven projects in FY 2022. ***FY 2021 to FY 2022 Increase/Decrease Statement:***			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603338D8Z / *Defense Modernization and Prototyping*	**Project (Number/Name)** 720 / *Quick Reaction Special Projects (QRSP)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Funding for this focus area in FY 2022 increases to support acceleration of high priority prototyping efforts.			
Title: Distributed, Collaborative, Multi-Function Devices for Electromagnetic Spectrum Agility Focus Area	-	7.103	7.423
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 ES is both a contested resource and unique domain requiring advanced maneuver. Tactics, techniques, 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, and multi-function devices. ***FY 2021 Plans:*** QRSP investment decisions are made during the execution year in response to DoD, CCMD, Service, and other government priorities. QRSP anticipates supporting seven to twelve projects in FY 2021. ***FY 2022 Plans:*** QRSP investment decisions are made during the execution year in response to DoD, CCMD, Service, and other government priorities. QRSP anticipates supporting eight to thirteen projects in FY 2022. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Funding for this focus area in FY 2022 increases to support acceleration of high priority prototyping efforts.			
Title: Multi-domain Experimentation and Demonstration Venues	-	5.000	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			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603338D8Z / *Defense Modernization and Prototyping*	**Project (Number/Name)** 720 / *Quick Reaction Special Projects (QRSP)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
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. ***FY 2021 Plans:*** Building on previous experience, six to eight demonstrations to accelerate innovation are planned for FY 2021. These demonstrations will focus on autonomous technologies, virtual reality, machine learning, signature management, and cyber security. Capabilities evaluated will include wearable near field communications devices; thermal/infrared camouflage; unmanned air and ground vehicles; mapping technologies for virtual reality applications; red teaming cyber security systems; and other priorities identified through engagement with stakeholders. ***FY 2022 Plans:*** 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.			
Title: Strategic Multi-Layered Assessment (SMA) Reach Back Cell ***Description:*** 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. ***FY 2021 Plans:*** SMA will continue to work with USCENTCOM via the Reach Back Cell to support ongoing operations by responding to queries from senior leaders. SMA will continue to develop the reach back concept to assist in understanding actor relationships and conducting if/then analysis. ***FY 2022 Plans:***	-	4.000	2.000

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603338D8Z / *Defense Modernization and Prototyping*	**Project (Number/Name)** 720 / *Quick Reaction Special Projects (QRSP)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
SMA 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 2021 to FY 2022 Increase/Decrease Statement:*** Funding for this focus area in FY 2022 decreases as resources are shifted within QRSP to deliver additional Modernization prototypes.			
Title: Prototyping Through Non-Traditional Pathways ***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, Combatant Command, 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. ***FY 2021 Plans:*** Prototyping Through Non-Traditional Pathways anticipates three to five reviews in FY 2021 with 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. ***FY 2022 Plans:*** Prototyping Through Non-Traditional Pathways anticipates four to six reviews in FY 2022 with 20 to 25 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.	-	3.000	3.000
Accomplishments/Planned Programs Subtotals	-	57.478	49.408

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Quick Reaction Special Projects (QRSP) will support FY 2022 performance metrics to transition projects to the warfighter and enable DoD modernization capabilities.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603338D8Z / *Defense Modernization and Prototyping*	Project (Number/Name) 721 / *Emerging Capabilities Tech Dev (ECTD)*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
721: *Emerging Capabilities Tech Dev (ECTD)*	0.000	0.000	76.345	66.035	-	66.035	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Due to a database error the FY 2021 funding amount reported in the summary funding table above for Project Code 721 Emerging Capabilities Technology Development (ECTD) is incorrect. The correct FY 2021 budget amount is $89.852 million. Net difference of $13.507 million is realigned to the ECTD Conceptual Prototyping to Support DoD Modernization Priorities focus area from Project Codes 720 Quick Reaction Special Projects (QRSP) and 723 Red Teaming (RT). This error will be corrected for the President's Budget (PB) 2023.

A. Mission Description and Budget Item Justification

ECTD funding supports the Under Secretary of Defense for Research and Engineering (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 prototypes, demonstrations, and experiments enable developers to showcase new and maturing capabilities in realistic environments and against realistic threats with operational user involvement. 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 2022 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 Services, CCMDs, industry, academia, Federally Funded Research and Development Centers (FFRDCs), University Affiliated Research Centers (UARCs), and Department of Defense (DoD) 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.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Fully Networked Command, Control, and Communications (FNC3) Universal Command & Control (UC2)	-	35.000	-
Description: In FY 2021, this focus area transitions from PE 0603699D8Z Emerging Capabilities Technology Development. UC2 will provide an interface that enables future commanders to dynamically connect any sensor in any domain to any shooter. The FNC3 UC2 project addresses a Secretary of Defense priority for integrated communications and networking. By focusing on a DoD-wide standard for the data layer of machine-to-machine (M2M) Command and Control (C2), the project will develop and demonstrate an efficient, evolvable, and broadly applicable standard to increase the interoperability, flexibility, and resiliency of			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603338D8Z / *Defense Modernization and Prototyping*	**Project (Number/Name)** 721 / *Emerging Capabilities Tech Dev (ECTD)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
FNC3 systems. Aligned with the Joint All-Domain Command & Control (JADC2) concept, UC2 compliant systems will dynamically respond by forming new systems and system combinations to address unanticipated, asymmetric, and evolving threats. The FNC3 UC2 project will provide warfighters faster access to new capabilities, while simplifying development and sustainment lifecycles, and lower operating and training costs. ***FY 2021 Plans:*** In FY 2021, the FNC3 UC2 project continues to refine and optimize the UC2 standard language and works to execute the FY 2021 demonstration. Additional enhancements to UC2 standard language will be developed and validated in coordination with the Joint Staff, Services, Defense Agencies, Combatant Commands, and defense industrial base partners. The Services will implement hardware and software modifications to C2 systems and counter unmanned aerial systems (C-UAS) sensors and mitigation solutions to be UC2 compliant. A C-UAS demonstration will be executed in late FY 2021 to demonstrate the flexibility UC2 compliant systems provide. The demonstration will illustrate the ability to continuously integrate different types of sensors and mitigation solutions, adapting to different demands of military installations, physical geographies, and threat profiles. The developed hardware and software prototypes will transition to the Services for further development and transition into Service Programs of Record. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FNC3 UC2 activities will complete at the end of FY 2021.			
Title: Tactical High-speed Offensive Ramjet for Extended Range (THOR-ER) ***Description:*** In FY 2021, THOR-ER transitioned from PE 0603699D8Z Emerging Capabilities Technology Development. The THOR-ER project will develop and demonstrate a full-scale missile prototype incorporating advanced solid fuel ramjet technologies, culminating in a series of operationally relevant flight demonstrations. THOR-ER enables leap-ahead gains in missile range and cruise speed while maintaining form factors similar to currently-fielded solid-rocket motor systems. Technology developed as part of the THOR-ER project will enhance the affordability and survivability of next generation weapon systems. THOR-ER is a co-development effort partnering with the U.S. Navy Naval Air Warfare Center, Weapons Division China Lake; the Norwegian Defence Research Establishment; and, the Norwegian industrial base partner, Nammo. ***FY 2021 Plans:*** In FY 2021, THOR-ER will conduct flight testing of the initial proof-of-concept test articles. Fabrication of full-scale missile prototype test articles and test planning will commence in preparation for the FY 2022 flight test series. In FY 2022, THOR-ER transitions to Program Element 0603183D8Z, Joint Hypersonic Technology Development & Transition, Project Code 066 Joint Hypersonic Transition Office (JHTO) for further development. ***FY 2021 to FY 2022 Increase/Decrease Statement:***	-	0.125	-

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603338D8Z / *Defense Modernization and Prototyping*	**Project (Number/Name)** 721 / *Emerging Capabilities Tech Dev (ECTD)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
In FY 2022, THOR-ER transitions to Program Element 0603183D8Z for further development.			
Title: Project 7905 ***Description:*** In FY 2021, Project 7905 transitioned from PE 0603699D8Z Emerging Capabilities Technology Development. This is a classified program. Additional information is available upon request. ***FY 2021 Plans:*** This is a classified program. Additional information is available upon request. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Project 7905 activities will complete at the end of FY 2021.	-	5.000	-
Title: Conceptual Prototyping to Support DoD Modernization Priorities ***Description:*** NOTE: In FY 2021 $13.507 million is realigned from Project Codes 720 Quick Reaction Special Projects (QRSP) and 723 Red Teaming (RT) to this focus area. This focus area supports the prototyping of cutting-edge land, sea, undersea, air, and space capabilities critical to the National Defense Strategy and modernization priorities and objectives of the Department of Defense (DoD). This effort matures and experiments with key component technologies and representative prototypes of fully networked command, control, and communications; 5G; space; autonomy; hypersonics; microelectronics; cyber; quantum science; directed energy; bio-technology; 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 concepts of operations. Conceptual prototyping activities seek to rapidly develop and demonstrate capabilities that can help maintain the 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, and non-traditional DoD partners. ***FY 2021 Plans:*** Projects will be selected in the year of execution to support National Defense Strategy priorities, DoD modernization priorities, and gaps in the joint Services' investments. Projects will focus on cost-effective, mission-focused efforts to design, mature, and deliver new concepts and technology prototypes aimed at supporting the Joint Force. Two to four prototype efforts are anticipated in FY 2021 leveraging Joint, Service, and interagency partnerships. ***FY 2022 Plans:***	-	0.320	57.822

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603338D8Z / *Defense Modernization and Prototyping*	**Project (Number/Name)** 721 / *Emerging Capabilities Tech Dev (ECTD)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Projects will be selected in the year of execution to support National Defense Strategy priorities, DoD modernization priorities, and gaps in the joint Services' investments. Projects will focus on cost-effective, mission-focused efforts to design, mature, and deliver new concepts and technology prototypes aimed at supporting the Joint Force. Six to twelve prototype efforts are anticipated in FY 2021 leveraging Joint, Service, and interagency partnerships. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Funding for this focus area in FY 2022 increases to support acceleration of high priority prototypes that address DoD Modernization Priorities.			
Title: Red Teaming to Support DoD Modernization Priorities	-	-	8.213
Description: This focus area supports investigations, experiments, and demonstrations that assess the susceptibility and vulnerability of emerging technology fields, to quickly identify unanticipated disruptive opportunities and technological dead ends. 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 much earlier in the development cycle. These prototypes increase agility and rate of innovation for emerging capabilities, while reducing cost, schedule, 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 strategic 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; chart new investment paths; and, develop new CONOPS. ***FY 2022 Plans:*** 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 2022, this project anticipates funding four to seven efforts to investigate red and blue impacts of technologies associated with DoD modernization priorities. Project selection will be guided by DoD modernization priorities, the National Defense Strategy, and			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603338D8Z / *Defense Modernization and Prototyping*	**Project (Number/Name)** 721 / *Emerging Capabilities Tech Dev (ECTD)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
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 2021 to FY 2022 Increase/Decrease Statement:*** Funding for the Red Teaming to Support DoD Modernization Priorities focus area transitions from Project Code 723 Red Teaming starting in FY 2022.			
Title: Silent Hammer (SH) ***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 maximum relevance and value. The Joint Electronic Advanced Technology (JEAT) Program Element 0603618D8Z supports the experiment concept development and planning efforts for SH events, while DM&P supports SH experiment execution efforts. ***FY 2021 Plans:*** Planning and preparation for the second SH experiment (SH-2) will continue through early FY 2021, with SH-2 scheduled for execution in late FY 2021. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** All SH-2 related activities will complete in early FY 2022.	-	4.000	-
Accomplishments/Planned Programs Subtotals	-	44.445	66.035

	FY 2020	FY 2021
Congressional Add: Emerging Capabilities Technology Support	-	7.500
FY 2021 Plans: The Emerging Capabilities Technology Support project directly supports the National Defense Strategy's priority to modernize key capabilities through discovery of innovative commercial technologies and concepts. In FY 2021, the project will demonstrate an innovative approach to identify and leverage emerging technologies to support DoD modernization. Specific 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.		
Congressional Add: Air Base Resilience Sensor	-	5.000

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603338D8Z / *Defense Modernization and Prototyping*	**Project (Number/Name)** 721 / *Emerging Capabilities Tech Dev (ECTD)*

	FY 2020	FY 2021
FY 2021 Plans: The Air Base Resilience Sensor project directly supports the National Defense Strategy's priority for increased lethality prototyping and integrating an advanced sensor system concept to enhance detection and tracking of threat systems. Previous resources provided above the President's budget in FY 2016, FY 2017, FY 2018, FY 2019, and FY 2020 developed an advanced sensor chip assembly (SCA) and prototype test unit incorporating the SCA to enable experimentation and validation of expected performance in maritime environments, targeting a FY 2022 system demonstration in an operationally relevant environment. In FY 2021, the SCA will undergo independent test and evaluation (T&E). Prototype test units will undergo T&E in FY 2021 and FY 2022 in operationally relevant environments to validate system performance for operational concepts of interest to the Services and Combatant Commands. This technology area is a congressional interest item and additional resources were provided above the President's budget. Details of this project are classified.		
Congressional Add: Open Source Intelligence ***FY 2021 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 2021, the project will demonstrate a novel Open Source Intelligence capability to support DoD modernization. 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 (RAA) Technology Development ***FY 2021 Plans:*** RAA 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 Warfighting Concepts. In FY 2021, 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 ***FY 2021 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 2021, the project will demonstrate an AI enabled sensor network to inform future acquisition efforts. Specific demonstrations and	-	8.400

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603338D8Z / *Defense Modernization and Prototyping*	**Project (Number/Name)** 721 / *Emerging Capabilities Tech Dev (ECTD)*

	FY 2020	FY 2021
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.		
Congressional Adds Subtotals	-	31.900

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.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603338D8Z / *Defense Modernization and Prototyping*	Project (Number/Name) *722 / Time Sensitive Targeting Defeat (TSTD)*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
722: *Time Sensitive Targeting Defeat (TSTD)*	0.000	0.000	10.002	0.000	-	0.000	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Due to a database error the FY 2021 funding amount reported in the summary funding table above for Project Code 722 Time Sensitive Targeting Defeat (TSTD) is incorrect. The correct FY 2021 budget amount is $18.366 million. Net difference of $8.364 million is realigned to the Time-Sensitive Target Defeat focus area from Project Code 720 Quick Reaction Special Projects (QRSP). This error will be corrected for the President's Budget (PB) 2023.

In FY 2022, funding and appropriate project investment areas from Project Code 722 Time Sensitive Targeting Defeat (TSTD) will be transferred to Program Element 0603648D8Z Joint Capability Technology Demonstration (JCTD) for proper alignment and execution. As part of PB 2023, all out year funding associated with the TSTD project code will transfer to Program Element 0603648D8Z.

A. Mission Description and Budget Item Justification

TSTD funds prototyping and experimentation activities that accelerate the development and fielding of capabilities to address the Find, Fix, and Finish kill-web against high-value targets. TSTD prototyping and experimentation activities employ the military utility of prototypes and experiments by leveraging technical demonstration programs to evaluate innovative capabilities in operationally relevant environments with direct warfighter involvement and feedback. TSTD leverages major exercise series, such as Northern Edge and Valiant Shield, as it executes the Joint Combined Demonstration Campaign (JCDC) and Tactical Responsive Intelligence, Surveillance, and Reconnaissance (ISR) Platforms and Payloads Watching Isolated Remote Environments (TRIPPWIRE) prototype and experiment venues. JCDC is a multi-year campaign that integrates prototypes and experiments into operational demonstrations and exercises to facilitate transition of prototype capabilities aligned with the DoD modernization priorities. TRIPPWIRE is a DoD initiative to operationalize the stratosphere by offering increased demonstrations of high-altitude ISR and communication systems.

Selected projects and experiments extend Service and Defense Agency investments by leveraging prototypes developed by traditional and non-traditional industry partners, utilizing proven commercial- and government-off-the-shelf technologies, rapidly maturing technologies within Service laboratories and Federally Funded Research and Development Centers (FFRDCs), and, leveraging technologies from allied nations to rapidly identify and address gaps within current and developing kill chain capabilities identified by the Services, Combatant Commands (CCMDs), and Joint Staff. Projects inform Service programs of record in addition to providing Services and CCMDs with residual leave behind capabilities for rapid fielding.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Time-Sensitive Target Defeat Focus Area	-	0.002	-

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603338D8Z / *Defense Modernization and Prototyping*	**Project (Number/Name)** 722 / *Time Sensitive Targeting Defeat (TSTD)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Description: NOTE: In FY 2021 $8.364 million is realigned from Project Codes 720 Quick Reaction Special Projects (QRSP) to this focus area. This project addresses the need for distributed, rapidly-deployed capabilities that can provide persistent sensing to Find, Fix, and Finish time-sensitive threats by integrating prototypes and experiments into a series of multi-domain operational demonstrations. Demonstrations focus on evaluating how the Joint Force can leverage modernization technologies, commercial space-based capability, and operationalization of the stratosphere to refine hypersonic and long-range fires kill chains to counter time-sensitive targets. ***FY 2021 Plans:*** In FY 2021, TSTD will execute JCDC and TRIPPWIRE into two joint multi-domain demonstrations exercises, such as Northern Edge 21, Talisman Sabre, or Pacific Europe/Pacific Defender to evaluate prototypes and experiments operational utility in operationally relevant environments with direct warfighter involvement and feedback. Two JCDC and TRIPPWIRE risk reduction demonstration events will be conducted prior to the exercises to ensure the prototypes and experiments are operationally feasible. A Counter-Stratospheric Operations experiment will be conducted within TRIPPWIRE. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** In FY 2022, the Time Sensitive Target Defeat focus area will transfer to Program Element 0603648D8Z Joint Capability Technology Demonstration (JCTD).			
Accomplishments/Planned Programs Subtotals	-	0.002	-

	FY 2020	FY 2021
Congressional Add: Stratospheric Balloon Research	-	10.000
FY 2021 Plans: The Stratospheric Balloon Research project directly supports the National Defense Strategy's priority for delivering innovative stratospheric prototyping capabilities and operationally demonstrating Joint Warfighting Concepts to increase our military advantage across the force. In FY 2021, the project will demonstrate stratospheric functional architecture and capabilities at Northern Edge 2021, MDO Live/Forager, and Project Convergence. 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. Details of this project are classified.		
Congressional Adds Subtotals	-	10.000

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603338D8Z / *Defense Modernization and Prototyping*	**Project (Number/Name)** 722 / *Time Sensitive Targeting Defeat (TSTD)*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

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. Prototyping partners include small businesses and non-traditional performers, industry, Federally Funded Research and Development Centers, and University Affiliated Research Centers.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603338D8Z / *Defense Modernization and Prototyping*	Project (Number/Name) 723 / *Red Teaming (RT)*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
723: *Red Teaming (RT)*	0.000	0.000	11.680	0.000	-	0.000	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Due to a database error the FY 2021 funding amount reported in the summary funding table above for Project Code 723 Red Teaming (RT) is incorrect. The correct FY 2021 budget amount is $5.506 million. Net difference of $6.174M is aligned to Project Codes 721 Emerging Capabilities Technology Development (ECTD) for execution. This error will be corrected for the President's Budget (PB) 2023.

In FY 2022, the Red Teaming project code will transition to a focus area under Project Code 721 Emerging Capabilities Technology Development (ECTD). As part of the President's Budget FY 2023, all out year funding associated with the Red Teaming project code will transition to a focus area under Project Code 721 ECTD.

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 to assess the susceptibility and vulnerability of emerging technologies and newly developed systems and to 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 2020	FY 2021	FY 2022
Title: Funding realignment to Project Code 721 Emerging Capabilities Technology Development (ECTD)	0.000	6.174	-
Description: Funding incorrectly reported in RT project code due to database error. Funding aligned to ECTD Conceptual Prototyping to Support DoD Modernization Priorities focus area. ***FY 2021 Plans:*** Funding realignment ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Funding realignment			
Title: Red Teaming to Support DoD Modernization Priorities	-	5.506	-

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603338D8Z / *Defense Modernization and Prototyping*	**Project (Number/Name)** 723 / *Red Teaming (RT)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Description: The project 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:*** 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 anticipates funding two to five 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. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** In FY 2022, the Red Teaming to Support DoD Modernization Priorities focus area will transfer to Project Code 721 Emerging Capabilities Technology Development.			
Accomplishments/Planned Programs Subtotals	0.000	11.680	-

C. Other Program Funding Summary ($ in Millions)

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603338D8Z / *Defense Modernization and Prototyping*	**Project (Number/Name)** 723 / *Red Teaming (RT)*

C. Other Program Funding Summary ($ in Millions)

Remarks

D. Acquisition Strategy

N/A

THIS PAGE INTENTIONALLY LEFT BLANK

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603342D8Z / *Defense Innovation Unit (DIU)*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	0.000	29.268	35.617	31.873	-	31.873	-	-	-	-	-	-
434: *DIU*	0.000	29.268	35.617	31.873	-	31.873	-	-	-	-	-	-

Note

Defense Innovation Unit Experimental (DIUx) was established in April 2015 and transitioned to 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, Secretary Mattis re-designated DIUx as the Defense Innovation Unit (DIU), removing the “x” (experimental) from the organization name to signify the permanence of the program. Effective FY 2020, DIU funding transferred from WHS to OSD, consistent with the organizational realignment under OUSD(R&E) following the disestablishment of the Office of the USD(Acquisition, Technology, & Logistics). This realignment also integrated the Unit into the broader Department of Defense research and engineering community, which provided opportunities to coordinate and de-conflict similar activities with the military departments, Defense Agencies, Department of Defense laboratories, the Defense Advanced Research Project Agency, the Small Business Innovation Research Program, and other entities in alignment with section 244 of the National Defense Authorization Act for FY 2019.

A. Mission Description and Budget Item Justification

The DIU mission is to strengthen U.S. national security by accelerating the adoption of commercial technology throughout the military and growing the national security innovation base. DIU partners with organizations across the Department of Defense (DoD), from the Services and components to combatant commands and defense agencies, to rapidly prototype and field advanced commercial solutions that address national security challenges. With offices in Silicon Valley, Boston, Austin, and in the Pentagon, DIU connects its DoD partners with leading technology companies across the country.

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), must reform our acquisition policies and approach to sustaining military-technical superiority. Notably, the critical technologies that forge military-technical superiority are increasingly dual use and rapidly developed by the commercial sector. While adversaries are challenging the U.S. across several dimensions, most importantly, our near peer competitors 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 the United States’ ability to project power, maintain international norms and rule of law, to provide credible deterrence, and prevail in conflict.

DIU increases the Department's access to leading-edge commercial technologies and talent, 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 national security innovation base to include more "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.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603342D8Z / *Defense Innovation Unit (DIU)*

Through a competitive prototype process, DIU identifies and provides access to technology companies and products on behalf of DoD organizations. Additionally, DIU executes projects to leverage commercial sector technology analogous to military applications thereby increasing dual-use technology agility for the DoD. DIU Prototyping funds facilitate the award of projects that can augment commercial technologies, existing government-owned capabilities, or concepts for defense application.

DIU focus on six technology areas where commercial industry is the lead:
• Advanced Energy and Materials - Leveraging proven advancement in energy and materials technology to enhance capabilities and strengthen resilience across installation and distributed operations.
• Artificial Intelligence (AI)/ Machine Learning (ML) – Applying AI/ML learning to accelerate critical decision making and operation impact.
• Autonomy – Adopting and countering autonomous systems with a focus on human-machine interaction and scalable teaming.
• Cyber – Making enterprise combat information open, accessible, and secure for defense personnel across the globe.
• Human Systems – Optimizing the human system and its enabling platforms through enhanced equipment, innovative training, and novel health applications.
• Space – Developing on-demand access to space, persistent satellite capabilities, and broadband space data transfer.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	29.398	26.141	26.849	-	26.849
Current President's Budget	29.268	35.617	31.873	-	31.873
Total Adjustments	-0.130	9.476	5.024	-	5.024
• Congressional General Reductions	-	-0.024			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	9.500			
• Congressional Directed Transfers	-	-			
• Reprogrammings	0.948	-			
• SBIR/STTR Transfer	-1.073	-			
• Program Adjustment	-	-	5.024	-	5.024
• Cancelled Account	-0.005	-	-	-	-

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2020	FY 2021
Project: 434: *DIU*		
Congressional Add: *Multi Orbital Platform*	-	4.500
Congressional Add: *Small Tactical Imagery Satellites*	-	5.000
Congressional Add Subtotals for Project: 434	-	9.500
Congressional Add Totals for all Projects	-	9.500

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603342D8Z *I Defense Innovation Unit (DIU)*

Change Summary Explanation

FY 2021 increase supports Multi Orbital Platform and Small Tactical Imagery Satellites (TacGeo).

FY 2022 increase supports requirement for the Artificial Intelligence (AI) portfolio.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603342D8Z / *Defense Innovation Unit (DIU)*	Project (Number/Name) 434 / *DIU*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
434: *DIU*	0.000	29.268	35.617	31.873	-	31.873	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Defense Innovation Unit Experimental (DIUx) was established in April 2015 and transitioned to 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, Secretary Mattis re-designated DIUx as the Defense Innovation Unit (DIU), removing the “x” (experimental) from the organization name to signify the permanence of the program. Effective FY 2020, DIU funding transferred from WHS to OSD, consistent with the organizational realignment under OUSD(R&E) following the disestablishment of the Office of the USD(Acquisition, Technology, & Logistics). This realignment also integrated the Unit into the broader Department of Defense research and engineering community, which provided opportunities to coordinate and de-conflict similar activities with the military departments, Defense Agencies, Department of Defense laboratories, the Defense Advanced Research Project Agency, the Small Business Innovation Research Program, and other entities in alignment with section 244 of the National Defense Authorization Act for FY 2019.

A. Mission Description and Budget Item Justification

The DIU mission is to strengthen U.S. national security by accelerating the adoption of commercial technology throughout the military and growing the national security innovation base. DIU partners with organizations across the Department of Defense (DoD), from the Services and components to combatant commands and defense agencies, to rapidly prototype and field advanced commercial solutions that address national security challenges. With offices in Silicon Valley, Boston, Austin, and in the Pentagon, DIU connects its DoD partners with leading technology companies across the country.

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), must reform our acquisition policies and approach to sustaining military-technical superiority. Notably, the critical technologies that forge military-technical superiority are increasingly dual use and rapidly developed by the commercial sector. While adversaries are challenging the U.S. across several dimensions, most importantly, our near peer competitors 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 the United States’ ability to project power, maintain international norms and rule of law, to provide credible deterrence, and prevail in conflict.

DIU increases the Department's access to leading-edge commercial technologies and talent, 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 national security innovation base to include more "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.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603342D8Z / *Defense Innovation Unit (DIU)*	**Project (Number/Name)** 434 / *DIU*

Through a competitive prototype process, DIU identifies and provides access to technology companies and products on behalf of DoD organizations. Additionally, DIU executes projects to leverage commercial sector technology analogous to military applications thereby increasing dual-use technology agility for the DoD. DIU Prototyping funds facilitate the award of projects that can augment commercial technologies, existing government-owned capabilities, or concepts for defense application.

DIU focus on six technology areas where commercial industry is the lead:
• Advanced Energy and Materials - Leveraging proven advancement in energy and materials technology to enhance capabilities and strengthen resilience across installation and distributed operations.
• Artificial Intelligence (AI)/ Machine Learning (ML) – Applying AI/ML learning to accelerate critical decision making and operation impact.
• Autonomy – Adopting and countering autonomous systems with a focus on human-machine interaction and scalable teaming.
• Cyber – Making enterprise combat information open, accessible, and secure for defense personnel across the globe.
• Human Systems – Optimizing the human system and its enabling platforms through enhanced equipment, innovative training, and novel health applications.
• Space – Developing on-demand access to space, persistent satellite capabilities, and broadband space data transfer.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Defense Innovation Unit (DIU)	29.268	26.117	31.873
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 national security and defense missions with companies developing cutting-edge commercial technology. DIU continuously experiments with methods to identify, contract, prototype, and transition novel commercial solutions from leading companies to the warfighter for applications in headquarters or operational environments and transfer technology with commercial entities that would not otherwise do work with the DoD. The end goal is to accelerate DoD adoption of cutting-edge technology and grow the national security innovation base to support U.S. military-technical superiority.			
FY 2021 Plans: 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 partners in the Services, components, 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, cyber, space, and advanced energy and materials.			
FY 2022 Plans: 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, components, Defense Agencies, and Combatant Commands. DIU works to solve challenges and issues for the			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603342D8Z / *Defense Innovation Unit (DIU)*	**Project (Number/Name)** 434 / *DIU*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Department in areas such as artificial intelligence and machine learning, autonomy, human systems, cyber, space, and advanced energy and materials. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The increase in funding supports prototype automation of data access, test and evaluation, and post-deployment monitoring to allow for continuous comparison (i) amongst artificial intelligence (AI) models built for the same application by multiple developers or (ii) of the same AI model built by the same developer, but over various points in time. Additionally, increased funding would enable DIU to prototype a structure by which end users can access models that have been evaluated in this manner in a straightforward way including access, startup procedure, and pricing model. .			
Accomplishments/Planned Programs Subtotals	29.268	26.117	31.873

	FY 2020	FY 2021
Congressional Add: Multi Orbital Platform ***FY 2021 Plans:*** These funds support ongoing work to create multi-orbit platforms in order to enable the establishment of an in-space logistics network. In particular, the funds will accelerate current DIU efforts related to orbital transfer and hosting platforms, in-space refueling, and supporting interfaces. These efforts take place primarily during preliminary and critical design review, which include some initial assembly integration and testing activities.	-	4.500
Congressional Add: Small Tactical Imagery Satellites ***FY 2021 Plans:*** These funds support multiple tactical imagery efforts, to include the U.S. Army Tactical GEOINT ("TacGEO") project requirements for satellite shipment and storage review and on-orbit checkout; the joint-sponsored "Peacetime Indications & Warnings" project requirement for preliminary and critical design reviews; assembly integration & test, flight readiness review, system checkout; and a new U.S. Army unmanned stratospheric systems project requirements for replicating space-based imagery capabilities from high altitude.	-	5.000
Congressional Adds Subtotals	-	9.500

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
• BA 04; O&M: *PE 0901583D8Z*	17.285	12.397	16.659	-	16.659	-	-	-	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603342D8Z / *Defense Innovation Unit (DIU)*	**Project (Number/Name)** 434 / *DIU*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost

Remarks

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

D. Acquisition Strategy

N/A

THIS PAGE INTENTIONALLY LEFT BLANK

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603375D8Z / *Technology Innovation*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	110.576	29.009	27.693	54.433	-	54.433	-	-	-	-	-	-
375: *Technology Innovation*	110.576	29.009	27.693	25.433	-	25.433	-	-	-	-	-	-
376: *Quantum Information Science Technology Innovation*	-	0.000	0.000	29.000	-	29.000	-	-	-	-	-	-

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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	30.000	27.709	25.735	-	25.735
Current President's Budget	29.009	27.693	54.433	-	54.433
Total Adjustments	-0.991	-0.016	28.698	-	28.698
• Congressional General Reductions	-	-0.016			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.986	-			
• Program Adjustment	-	-	28.698	-	28.698
• Cancelled Account	-0.005	-	-	-	-

Change Summary Explanation

FY 2022 increase supports Quantum Information Science Research and Development.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603375D8Z / *Technology Innovation*	Project (Number/Name) 375 / *Technology Innovation*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
375: *Technology Innovation*	110.576	29.009	27.693	25.433	-	25.433	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

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, share costs with OGA partners, inform warfighter requirements for follow-on acquisition through traditional DoD channels, and allow other DoD research and development (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 2020	FY 2021	FY 2022
Title: Technology Innovation	29.009	27.693	25.433
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. Prior year projects included funding of promising commercial advanced technology demonstration projects in the areas of biotechnology, quantum science, fully networked command, control, and communications, and space.			
FY 2021 Plans: Further expand support across National Defense Strategy technology focus areas 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: (1) Advanced emerging biotechnologies; and (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 2022 Plans: Maintain support for the following Biotechnology and Quantum efforts: (1) Advanced emerging biotechnologies demonstrated against operational use cases; projects will be competitively selected from proposals across DoD, with a focus on multi-lab and multi-Service efforts that will build partnerships across the DoD biotechnology community.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603375D8Z / *Technology Innovation*	**Project (Number/Name)** 375 / *Technology Innovation*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
(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 2022 efforts will be focused on clock design and build, with technology development to mitigate risks through integration, analysis, and testing. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Changes reflect minor budget fluctuation.			
Accomplishments/Planned Programs Subtotals	29.009	27.693	25.433

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 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603375D8Z / *Technology Innovation*	Project (Number/Name) 376 / *Quantum Information Science Technology Innovation*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
376: *Quantum Information Science Technology Innovation*	-	0.000	0.000	29.000	-	29.000	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Department of Defense (DoD) has pioneered and advanced quantum information science (QIS) for nearly thirty years, leading the field to its current state. In order to sustain technological superiority, the Department must continue to proactively engage in QIS research and development in timing, sensing, computing, and networking applications.

Leveraging innovative technologies from both defense and commercial sources, to include non-traditional sources such as startup companies, has the potential to rapidly advance this field to address warfighter problem sets. This funding will be used to demonstrate and mature emerging QIS technologies.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Quantum Information Science Technology Innovation	-	-	29.000
FY 2022 Plans: Maintain and further expand support across OUSD(R&E) Quantum Science Roadmap technology areas: (1) Next Generation DoD Atomic Clock: Acceleration in risk reduction toward FY 2025 goals. (2) Quantum Inertial Measurement Unit Experiment: Pursuing prototyping phase. (3) Optical Clock Prototyping: Acceleration of prototyping. (4) Quantum computing cloud access for medium and small businesses: In response to FY 2021 NDAA, Section 214. (5) Quantum networking: Funding innovative interagency efforts for the Washington Metro Quantum Network Research Consortium.			
FY 2021 to FY 2022 Increase/Decrease Statement: Increase due to OMB Passback for Quantum efforts.			
Accomplishments/Planned Programs Subtotals	-	-	29.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603375D8Z / *Technology Innovation*	**Project (Number/Name)** 376 / *Quantum Information Science Technology Innovation*

D. Acquisition Strategy

N/A

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603375D8Z / *Technology Innovation*	**Project (Number/Name)** 376 / *Quantum Information Science Technology Innovation*

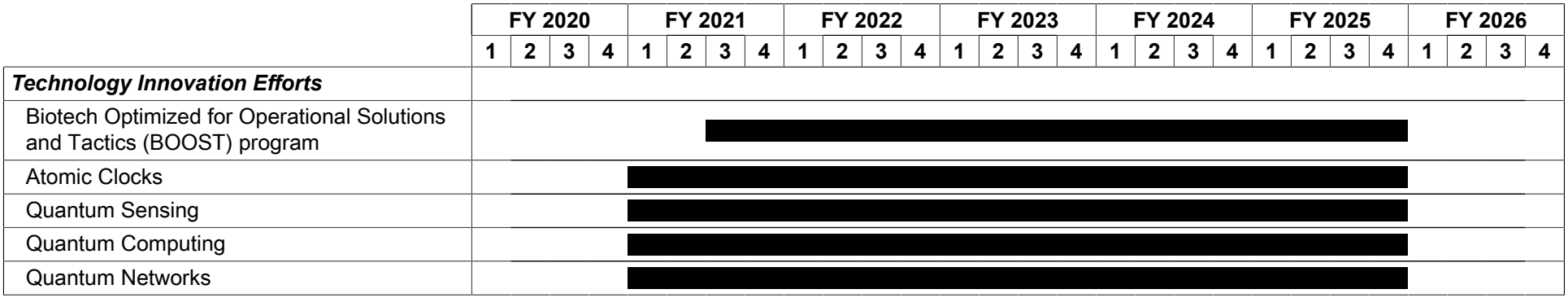


Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603375D8Z / *Technology Innovation*	**Project (Number/Name)** 376 / *Quantum Information Science Technology Innovation*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Technology Innovation Efforts				
Biotech Optimized for Operational Solutions and Tactics (BOOST) program	3	2021	4	2025
Atomic Clocks	1	2021	4	2025
Quantum Sensing	1	2021	4	2025
Quantum Computing	1	2021	4	2025
Quantum Networks	1	2021	4	2025

THIS PAGE INTENTIONALLY LEFT BLANK

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603527D8Z / *Retract Larch*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	645.695	154.415	130.220	99.175	-	99.175	-	-	-	-	-	-
527: *Retract Larch*	645.695	154.415	130.220	99.175	-	99.175	-	-	-	-	-	-

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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	159.688	130.283	139.226	-	139.226
Current President's Budget	154.415	130.220	99.175	-	99.175
Total Adjustments	-5.273	-0.063	-40.051	-	-40.051
• Congressional General Reductions	-	-0.063			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-5.273	-			
• Program Adjustment	-	-	-40.051	-	-40.051

Change Summary Explanation

The FY 2022 funding request was reduced to fund other higher priority DoD missions.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603527D8Z / *Retract Larch*	Project (Number/Name) 527 / *Retract Larch*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
527: *Retract Larch*	645.695	154.415	130.220	99.175	-	99.175	-	-	-	-	-	-
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, Resource Management in the Office of the Under Secretary of Defense for Research and Engineering

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Retarct Larch	154.415	130.220	99.175
Description: Information is classified. ***FY 2021 Plans:*** Information is classified. ***FY 2022 Plans:*** Information is classified. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Decrease to realign funds for higher priority DoD missions.			
Accomplishments/Planned Programs Subtotals	154.415	130.220	99.175

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603618D8Z / *Joint Electronic Advanced Technology*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	-	11.762	15.152	18.221	-	18.221	-	-	-	-	-	-
245: *EW Enterprise Exploration and Innovation*	-	11.762	15.152	18.221	-	18.221	-	-	-	-	-	-

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 electronic technologies. Understanding and addressing 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 forces and groups within operational environments - and coordinate all actions of our military forces.

Historically, the United States has had significant technological advantages in EMS warfighting technologies, specifically sensors, communications, and countermeasures. This is no longer the case in many technology areas due to the rapid commercialization of advanced electronic systems and components, the broad proliferation of these technologies, and the concurrent rise of cyber-related EMS technologies. Potential adversaries have leveraged these advances to develop and field competing and asymmetric capabilities to offset historic U.S. advantages. These efforts have made U.S. operations in the EMS and cyberspace significantly more difficult, and they continue to do so at an accelerating rate. Adversary radars are evolving from fixed analog systems to programmable digital variants with agile waveforms and unknown behaviors making preprogrammed electronic countermeasure less effective. Foreign developments include new generations of challenging threats ranging from small unmanned air systems and easily transportable Man-Portable Air Defense Systems (MANPADS) to dedicated anti-access area denial (A2/AD) military systems including integrated air defense systems and increasingly capable cruise and ballistic missiles that have incorporated the most advanced sensors, communication and electromagnetic warfare (EW) technologies.

The accelerating pace of technological innovation has fast-tracked the rate at which new EMS and cyber threats are appearing. Concurrently, the effective operational lifetime of many advanced technologies is decreasing. For these reasons, the Department of Defense (DOD) must develop and field new EW and EW-cyber capabilities 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 maturing of innovative technologies to address these EW and EW-Cyber warfighting challenges and enable the development, new leap-ahead EMS warfighting capabilities for U.S. warfighters. The program specifically focuses on EW and EW-Cyber-related technologies that fall outside the Services' purviews or are not being developed quickly enough.

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

EW E&I research efforts identify, explore, and accelerate the maturing and demonstration of new EW- and EW-cyber related technologies. Technologies enabling and/or supporting all areas of electromagnetic spectrum warfare (EW) are covered including electromagnetic attack (EA), electromagnetic protection (EP), and

electromagnetic support (ES). EW E&I research is performed in state-of-the-art laboratories and validated side-by-side with competing developmental technologies from the Services, National laboratories, industry and academia in field environments under real-world conditions to meeting EW and EW-Cyber warfighting needs and providing leap-ahead EW and EW-Cyber capabilities.

EW E&I includes efforts focusing specifically on EW-Cyber-related technologies in a sub-project designated EW-Cyber Interface (EWCI). EWCI efforts specifically focus on develop and advance the technological bases for “over-the-air” algorithmic warfare utilizing existing and new generations of EW-Cyber technologies and systems.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	12.063	15.164	15.425	-	15.425
Current President's Budget	11.762	15.152	18.221	-	18.221
Total Adjustments	-0.301	-0.012	2.796	-	2.796
• Congressional General Reductions	-	-0.012			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.301	-			
• Program Adjustment	-	-	2.796	-	2.796

Change Summary Explanation

The FY 2022 increase supports additional Electronic Warfare/Cyber efforts.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603618D8Z / *Joint Electronic Advanced Technology*	Project (Number/Name) 245 / *EW Enterprise Exploration and Innovation*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
245: *EW Enterprise Exploration and Innovation*	-	11.762	15.152	18.221	-	18.221	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Project Code 245, Electronic Warfare Enterprise Exploration and Innovation (EW E&I) research efforts identify, explore, and accelerate the maturing and demonstration of new EW- and EW-Cyber-related technologies. Significant advances in all of the areas impacting EW and EW-cyber have resulted in new generations of threat systems that are challenging the traditional dominance the U.S. has had in these areas. These advances also provide opportunities to develop new generations of overmatch EW and EW-Cyber capabilities for U.S. warfighters.

While there are a wide variety of potential investment areas within this technology tradespace, the Joint Electronic Advanced Technology (JEAT) Program focuses on specific areas where Service investments are lagging to accelerate the development and advancement of technologies that will benefit warfighters across multiple Services and operational domains. The JEAT Program's current EW E&I thrusts include Passive Sensor Detection and Defeat, Platform Self-Protection, EW Technology Enablers, EW-Cyber Interface (EWCI), and EW Collaboration and Cognizance.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: EW Enterprise Exploration and Innovation (EW E&I)	11.762	15.152	18.221

Description: EW E&I research efforts identify, explore and accelerate the maturing and demonstration of new EW- and EW-Cyber-related technologies. Current EW E&I initiatives research thrusts include Passive Sensor Detection and Defeat (PSDD), Platform Self-Protection (PS-P), EW Technology Enablers (EW Tech), EW-Cyber Interface (EWCI) and EW Collaboration and Cognizance (EW C&C).

Passive Sensor Detection and Defeat (PSDD): Modern integrated air defense systems (IADS) employ a variety of radar sensing technologies to detect, target and engage adversary aircraft. While classic IADS radars emitted radiofrequency radiation and collected the radiation reflected off targets within their field of view with the same aperture, computational advances have enabled passive (non-emitting) radar collectors to capture the reflected (radar) radiation and provide targeting solutions to engagement assets (missiles, aircraft, directed energy, etc.). Because these passive systems emit no radiation, current EW countermeasures (jamming and other EW techniques) cannot be effectively employed against them. This leaves U.S. aircraft attacking such IADS architectures vulnerable to unforeseen attacks. PSDD research identifies, explores and accelerates the maturing and demonstration of new technologies to provide defensive capabilities against these passive sensors. The initial PSDD goal is to develop and validate the technologies that will enable the development of a single user-configurable payload to can deliver multiple EW and EW-Cyber effects against passive systems.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603618D8Z / *Joint Electronic Advanced Technology*	**Project (Number/Name)** 245 / *EW Enterprise Exploration and Innovation*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022

Platform Self-Protection (PS-P): A wide variety of radiofrequency (RF) and electro-optical (EO) technologies are employed by modern militaries to enable the engagement and negation of attacking military systems. RF sensor systems including IADS radars and radars on ships, aircraft, ground and naval vessels and engagement missiles (ballistic, cruise, air-to-air, surface-to-air, etc.) are used to detect and provide targeting and engagement solutions to counter adversaries' military capabilities. EO systems are incorporated into missile seekers and also associated with high energy laser engagement systems being fielded by near peer adversaries. To ensure successful U.S. military actions, technologies that protect U.S. platforms and facilities against these new generations of much more capable RF and EO detection/targeting/engagement sensors and seekers are essential. This thrust identifies, explores, and accelerates the maturing and demonstration of new technologies to counter adversaries' advanced RF and EO sensor and seeker threats. To begin identifying the most significant developmental opportunities, JEAT issued a Response for Information (RFI) call in FY 2020.

Electromagnetic Warfare Technology Enablers (EW Tech): Significant advances in materials, electronics (including photonics, plasmonics, spintronics, magnetronics, etc.), RF and communications sciences, optical and laser sciences, and information and computational sciences are enabling new generations of extremely powerful applications in a wide variety of fields. For example, artificial intelligence and machine learning (AI/ML) technologies are beginning to impact electromagnetic spectrum (EMS) operations. The advantages that AI/ML approaches can provide are considerable, but multiple runs addressing the same scenarios often provide disparate results for both the same assets in the same scenarios and for different assets in different locations within the scenarios. Ascertaining the optimal employment tactics and strategies thus becomes difficult for offensive and defensive operations in both proactive and reactive EW modes. EW Tech research seeks to leverage these advances to enable commensurate advances in the EW and EW-Cyber warfighting realms.

EW-Cyber Interface (EWCI): EWCI is a sub-project within EW E&I focusing specifically on EW-Cyber-related technologies). Leveraging technologies from other EW- and Cyber-related technology development efforts within the JEAT Program and across the (DOD), EWCI efforts develop and advance the technological bases for "over-the-air" algorithmic warfare utilizing existing and new generations of EW-Cyber technologies and systems.

EW Collaboration and Cognizance (EW C&C): EW C&C research efforts focus on maintaining an awareness of global research and development (R&D) efforts impacting EMS, EW and EW-Cyber warfighting technologies; guiding, facilitating, ensuring collaboration and providing the Office of the Secretary of Defense (OSD) oversight of technology development efforts across the DOD EW and EW-Cyber developmental communities; and providing key insights to senior leaders and decision-makers so they can more effectively direct all Department EW and EW-Cyber technology development programs and processes.

FY 2021 Plans:

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603618D8Z / *Joint Electronic Advanced Technology*	**Project (Number/Name)** 245 / *EW Enterprise Exploration and Innovation*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Passive Sensor Detection and Defeat (PSDD): • Research efforts leveraging AI/ML technologies to provide improved, more accurate characterization of emitters within the EMS (detection, classification and geolocation) will enhance and accelerate the development of technologies to provide greater electromagnetic protection (EP) and enable electromagnetic attack (EA) against passive sensors. Current efforts were identified in JEAT's EW Request for Information (RFI), which was completed in late 2020. o OX EYE will explore technologies to counter adversary attempts to deceive U.S. cognitive and autonomous operations capabilities. o RADEC, the RF Ensemble Classifier (RADEC), will explore AI/ML approaches to facilitate the rapid, accurate detection, identification, and geolocation of foreign RF emitters of interest. • Technologies developed in these and other efforts across DOD will be explored side-by-side with other developmental technologies in the SILENT HAMMER 2 (SH-2) field experimentation venue under very complex EM environment conditions. This venue was designed to identify the technologies that show the greatest potential for addressing passive sensor threats. Twice as many experiment teams are participating in SH-2 as there were in the first venue in this series of field experimentation venues, SH-1. Both EW and EW-Cyber technologies including the JEAT-funded LOCUST effort (see below) will be explored in SH-2. • Integrate the Future Autonomous Battlespace RF Integrating Capability (FABRIC) active electronically scanned aperture (AESA) antenna and direction finding algorithms into the LOCUST EW/EW-Cyber demonstrator for validation in (SH-2). Platform Self-Protection (PS-P): • Examine the RF countermeasure (RFCM) and electromagnetic attack (EA) trade and opportunity spaces in a study to identify new RFCM technologies to enable more effective aircraft countermeasures against RF-guided missile threats. Plans will be developed to begin exploring and developing the most promising technologies identified in the RFCM Study in FY 2022. EMW Technology Enablers (EW Tech): • Using AI/ML capabilities developed in JEAT's Digital Attack Surface Execution Environment (DASEE) effort, begin developing ontologies to enable better EMS modelling and simulation and advance the use of AI/ML-aided battlespace comprehension and course of action development to enhance U.S. tactical and strategic EMS wargaming and operational employment. • The first two field demonstrations of the Next Generation Fully Adaptive Radar (NG-FAR) will occur in FY 2021. EW-Cyber Interface (EWCI): • Complete the development and demonstration of a classified EW-Cyber capability (Sierpinski). • Complete enhancement of an EW-Cyber capability and integrate it into the LOCUST EW/EW-Cyber demonstrator for validation in SH-2.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603618D8Z / *Joint Electronic Advanced Technology*	**Project (Number/Name)** 245 / *EW Enterprise Exploration and Innovation*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
EW Collaboration and Cognizance (EW C&C): Several hundred million dollars are spent each year to develop better EW and EW-Cyber capabilities for U.S. warfighters. EW C&C efforts supporting the Office of the Under Secretary of Defense (Research and Engineering), EW and Countermeasures (OUSD(R&E),EW&C) facilitate greater collaboration across these initiatives through work with planners and developers across the Services, National Laboratories, Industry, academia, and international defense partners. Participation in the EW Community of Interest facilitates these efforts and provides insights for decision-makers within OSD and the Services and the EW Executive Committee. EW C&C efforts also enable the identification and development of collaboration opportunities such as JEAT's SILENT HAMMER field experimentation venues.			
FY 2022 Plans: Passive Sensor Detection and Defeat (PSDD): • The findings of SH-2 will guide the development of a follow-on SH venue (SH-3) to mature the technologies that showed promise in SH-1 and SH-2 and assess new approaches and technology enhancements that are being explored in JEAT research and in the DOD EW and EW-Cyber technology development communities. • Continue the development of OX EYE to explore technologies to counter adversary attempts to deceive U.S. cognitive and autonomous operations capabilities. • Complete initial assessment of RADEC's design and approach. Begin expansion of RADEC's AI/ML use to facilitate the rapid, accurate detection, identification and geolocation of multiple classes of specific foreign RF emitters of interest. Platform Self-Protection (PS-P): Conduct a Next Generation Infrared (IR) Countermeasures (IRCM) Study to identify the greatest technological challenges and developmental opportunities for protecting U.S. assets against foreign threats employing IR sensors and seekers. This study will provide developmental recommendations that will be explored in FY 2023 JEAT research efforts. • Explore and demonstrate capabilities of the Deep Space Radio (DESPERADO) technology demonstrator, which was identified in the FY 2020 EW RFI. Explore DESPERADO's capabilities to provide intelligent RF detection for enabling more effective EA and EP of U.S. assets. If DESPERADO warrants further investigation, subsequent development plans will be identified. • Wideband ISR (Intelligence Surveillance Reconnaissance) Cyber EW D5 (Disrupt, Degrade, Deceive, Deny, Destroy (WICKED CROW), which was identified in the FY2020 EW RFI, is a functionally dynamic and cost effective EW/EW-Cyber/ISR/information operations (IO) family of systems capable of both offensive and defensive operations. To validate its utility, FY21 efforts will assessing WICKED CROW's Self-Networking Electronic Attack (SNEAK) advanced-electronic-attack-combined-with-low-bandwidth-communications capability. SNEAK uses the frequency agility and signal processing capabilities of advanced EA systems to enable communication at the frequencies used by the threats while reducing their ability to detect or jam inter-vehicle communication. EW Technology Enablers (EW Tech):			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603618D8Z / *Joint Electronic Advanced Technology*	**Project (Number/Name)** 245 / *EW Enterprise Exploration and Innovation*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
• Complete the third, final demonstration of NG-FAR. Develop transition plans and plans for demonstrating NG-FAR in Northern Edge 2023. • Begin development and initial assessment of the Policy-Based EW Capability (PBEWC). PBEWC seeks to increase EW and EW-Cyber effectiveness in the battlefield through the development of ontologies and heuristics to guide EW and EW-Cyber employment, operational decision planning, and execution. EW Collaboration and Cognizance (EW C&C): Continue FY 2021 OUSD(R&E),EW&C work to guide, shepherd and oversee all EW and EW-Cyber technology development across DOD. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Funds added in FY 2022 will enable expanded EW and EW-Cyber technology acceleration efforts within the JEAT Program.			
Accomplishments/Planned Programs Subtotals	11.762	15.152	18.221

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

THIS PAGE INTENTIONALLY LEFT BLANK

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603648D8Z / *Joint Capability Technology Demonstration (JCTD)*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	1,064.728	87.384	71.452	102.669	-	102.669	-	-	-	-	-	-
648: *Joint Capability Technology Demonstration (JCTD)*	1,064.728	87.384	71.452	102.669	-	102.669	-	-	-	-	-	-

Note

In FY 2022, all funding and investment areas in the Time Sensitive Targeting Defeat (TSTD) project code (P-722 within program element (PE) 0603338D8Z) will be incorporated into the Joint Capability Technology Demonstration PE for proper alignment and execution to support the new priorities of the Under Secretary of Defense for Research and Engineering (USD(R&E)).

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, PE 0603648D8Z, has refined its project selection to further strengthen alignment with the Department's mandate to build a more lethal force, strengthen alliances, and enable the DoD to achieve greater performance and affordability. The JCTD program focuses on utilizing existing technologies (typically Technical Readiness Level (TRL) 3 or 4) to provide experimental and early prototypes of new capabilities to the joint warfighter. The key tenets for project selection and resourcing reflect the Joint Forces' highest, end-to-end joint mission priority areas that present significant warfighter risk and suffer from inadequate Service/Title-10 investment.

In FY 2021, the JCTD Program will specifically focus its portfolio investments to: (1) provide real-time management of advanced electronic warfare and intelligence, surveillance, and reconnaissance (ISR) sensors and platforms to find, fix, and finish fleeting targets that accelerate kill chain activities against time sensitive targets; (2) operationalize low-cost and persistent DoD stratospheric architectures to rapidly reconstitute or augment space assets that are vulnerable to adversarial degradation/ attrition; (3) connect Service sensors, data, and shooters to disparate targeting echelons that accelerate the execution of precision fire missions while integrating future Hypersonics and autonomous loitering weapon systems; (4) accelerate reliable, wideband, mesh networks for critical information transport across a wider, over-the-horizon battlespace; (5) deliver scalable, machine learning-enabled capabilities that advance full-spectrum cyberspace operations and strengthen platform-agnostic robotics to defend against unauthorized control, detect behavioral abnormalities, and harden against code tampering; (6) deliver transformational capability to modernized logistics nodes within contested environments, and automate the deployment, employment, and sustainment of forces through distributed and self-directed logistical support operations.

JCTD outcomes are designed to accelerate transition by demonstrating and evaluating prototypes in operationally relevant environments. Based on the results of a Military User Assessment (MUA) performed under the cognizance of a Combatant Command (CCMD) sponsor, the products of a JCTD are "left behind" for immediate Warfighter use, transitioned to a program of record (PoR), or returned to the technical base for further development. The JCTD program uses MUAs to further inform acquisition pathways to field initial capabilities one to two years faster, or prompt major acquisition program decisions prior to milestone A or B approvals. Therefore, the JCTD program serves as a technology catalyst, rapid capability provider, and transition-bridge between the USD(R&E) and the Undersecretary of Defense, Acquisition and Sustainment (USD(A&S)) offices.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603648D8Z *I Joint Capability Technology Demonstration (JCTD)*

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	89.859	85.452	89.929	-	89.929
Current President's Budget	87.384	71.452	102.669	-	102.669
Total Adjustments	-2.475	-14.000	12.740	-	12.740
• Congressional General Reductions	-	-14.000			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-2.460	-			
• Program Adjustment	-0.015	-	-1.511	-	-1.511
• Transfer from RDT&E Program Element (PE) 0603338D8Z	-	-	14.251	-	14.251

Change Summary Explanation

The FY 2022 current president's baseline budget of $102.669 is an increase of $14.251 million from the previous total of $89.929 million that includes the transfer of the Time Sensitive Targeting Defeat (TSTD) project code (P-722 within program element (PE) 0603338D8Z) for proper alignment and execution. The TSTD funding realignment coincides with recent organizational changes, placing TSTD execution under the operational cognizance of the Demonstration component within the JCTD program. The FY 2022 current president's baseline budget further reflects a reduction of due to economic assumption and a reduction of $0.052 million for other adjustments and DoD priorities.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603648D8Z / *Joint Capability Technology Demonstration (JCTD)*	Project (Number/Name) 648 / *Joint Capability Technology Demonstration (JCTD)*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
648: *Joint Capability Technology Demonstration (JCTD)*	1,064.728	87.384	71.452	102.669	-	102.669	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

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), Fully Networked Command, Control and Communications (FNC3), Fire Support Next (FSN), Rapid Precision Strike (RPS), Contested Logistics, Assured Position Navigation and Timing (APNT), Persistent Intelligence, Surveillance, and Reconnaissance (PISR), Information Dominance (INDM), and Cyber Effects Operations (CYEFFO). 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 2020	FY 2021	FY 2022
Title: High-altitude Attritable Link Offset Geo-location (HALO-GEO) ***Description:*** Previously funded 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 capability 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. In FY 2020, HALO-GEO conducted technical demonstrations and design reviews. The decision was made to close this project following congressional marks.	6.071	-	-
Title: Brilliant Effects Employment Shadow (BEES) ***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 2020, BEES conducted operational demonstrations and a military utility assessment. The BEES JCTD transitioned to a U.S. Navy, U.S. Marine Corps, and a U.S. Air Force program of record. BEES completed in FY 2020.	0.172	-	-
Title: More Situational Awareness for Industrial Control Systems (MOSAICS)	2.342	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603648D8Z / *Joint Capability Technology Demonstration (JCTD)*	**Project (Number/Name)** 648 / *Joint Capability Technology Demonstration (JCTD)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
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 provides cyber defense for supervisory industrial control systems for critical warfighting infrastructure. MOSAICS provides 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 2020, MOSAICS conducted an operational demonstration (OD); delivered the fielded prototype, validated concept of operations and training packages; updated Unified Facilities Criteria and conducted its military utility assessment (MUA). MOSAICS transitioned to U.S. Navy Naval Facilities Engineering Command (NAVFAC) for sustainment in FY 2020 Program Objective Memorandum (POM). The JCTD completed in FY 2020.			
Title: Sea Launched Army Tactical Missile System (ATACMS) from Shipboard High Mobility Artillery Rocket System (HIMARS) (SLASH) ***Description:*** Previously funded JCTD. SLASH supports the National Defense Strategy's focus on joint lethality in contested environments. In FY 2020, SLASH concluded its operational and technical demonstrations and the Military Utility Assessment focused on HIMARS shipboard integration and shipboard command and control (C2) architecture. SLASH JCTD will transition to the Strategic Capability Office (SCO) to support integration with Palletized Field Artillery Launcher (PFAL) in order to expand on the SLASH capability and support additional future fleet operations and U.S. Army Tactical Missile System (ATACMS) Program of Record. The JCTD completed in FY 2020.	1.861	-	-
Title: Gunsmoke-J ***Description:*** Previously funded JCTD. Gunsmoke-J uses emerging advanced electronics to allow the use of dedicated intelligence assets to provide tactically actionable targeting data to warfighters on a more responsive and persistent timeline. This significantly improved reaction times and provided greatly enhanced targeting information for Warfighters. Gunsmoke-J was originally planned for completion in FY 2019, however due to launch delays (ride share to space), it will now extend into FY 2021. In FY 2020, Gunsmoke-J completed prelaunch testing, safety, and flight readiness reviews of the space systems. All payloads were confirmed manifested and ready to launch in 1Q FY 2021. The Gunsmoke-J satellite will launch in 1Q FY 2021, with on-orbit operational demonstrations culminating in a military utility assessment (MUA). Gunsmoke-J will complete in FY 2021 and transition to an U.S. Army Program of Record.	0.344	-	-
Title: Tactical Mobile Over-the-Horizon Radar (TACMOR) ***Description:*** Title: Tactical Mobile Over-the-Horizon Radar (TACMOR) Description: Previously funded JCTD. TACMOR will support air domain awareness and maritime domain awareness requirements over the Western Pacific region. The project will demonstrate a sub-scaled Over-the-Horizon Radar (OTHR) that	0.441	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603648D8Z / *Joint Capability Technology Demonstration (JCTD)*	**Project (Number/Name)** 648 / *Joint Capability Technology Demonstration (JCTD)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
is a quarter the size of traditional OTHR systems. In FY 2020, TACMOR designed and fabricated transmit/receive enclosures, fabricated transmit/receive arrays, and integrated system components with U.S. partner nations. The transition was slowed due to FY 2020 Congressional Marks to this PE. The military utility assessment will be conducted in FY 2021 using partner funding, and transitioned to the U.S. Air Force. TACMOR will complete in FY 2021.			
Title: Autonomous Aerial Insertion and Resupply into Dense, Urban, Complex Terrain (AAIRDUCT) ***Description:*** Previously funded JCTD. AAIRDUCT supports the National Defense Strategy's focus to sustain Joint Force military advantage in austere locations and the DOD's modernization priority for fully networked command, control and communications. AAIRDUCT integrates and demonstrates 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 2020, AAIRDUCT completed successful operational testing of the Multi-Use Aerial Dispersing System and numerous successful airdrop demonstrations of their Joint Precision Aerial Delivery System (JPADS). Due to COVID19 impacts, some FY 2020 funds were used to complete the JCTD in FY 2021. AAIRDUCT conducted final airdrop demonstrations in early FY 2021 in support of an operational demonstration culminating in a military utility assessment (MUA). AAIRDUCT will transition to the U.S. Marine Corps Battlefield Resupply Program Executive Office in FY 2021 using partner funding.	1.833	-	-
Title: Mobile Unmanned Air Vehicle Distributed Lethality Airborne Network (MUDLAN) ***Description:*** Previously funded JCTD. MUDLAN supports the National Defense Strategy's focus on command, control, communications, computers, intelligence, surveillance and reconnaissance (C4ISR) and the fully networked command, control and communications (FNC3) modernization priority. In FY 2020, MUDLAN performed flight testing on air, land, and sea platforms to demonstrate military utility of high data rate communications nodes, and demonstrated over-the-horizon, distributed communications capabilities at scale. MUDLAN also incorporated 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. Due to COVID19 impacts, this JCTD will complete in FY 2021.	2.005	-	-
Title: Undersea Communications With Optical Laser Frequencies (Under C-WOLF) ***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	0.916	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603648D8Z / *Joint Capability Technology Demonstration (JCTD)*	**Project (Number/Name)** 648 / *Joint Capability Technology Demonstration (JCTD)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
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 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. In FY 2020, Under C-WOLF completed the AWI platform integration; conducted laboratory testing of the ATW system; and performed an operational demonstration. Under C-WOLF continued transitioning capabilities to the U.S. Navy, Program Executive Office, Command, Control, Communications, Computers, and Intelligence. Due to COVID19 impacts, this JCTD will complete in FY 2021.			
Title: Special Advanced Low-cost Surveillance Alternative (SALSA) ***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 2020, SALSA conducted final technical demonstrations and an operational demonstration. Due to COVID19 impacts, the final military utility assessment will occur in FY 2021. SALSA will transition the technical package and prototypes to U.S. Northern Command (USNORTHCOM) and the U.S. Army, Program Executive Office, Missiles and Space (PEO M&S). The JCTD completes in FY 2021.	0.166	-	-
Title: Resilient Autonomy (RA) ***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 2020, RA conducted collision avoidance software development, and technical flight demonstrations in the HQ-10 aircraft. RA also began integration of sensors into the HQ-90 airframe. Due to COVID19 work restrictions, the team implemented a remotely accessed, simulation environment that provided feedback on system performance/ decision-making to programmers. RA will conduct additional simulations and flight demonstrations in support of an operational demonstrations culminating in a military utility assessment (MUA). RA technology will transition to the U.S. Army Special Operations Program of Record.	2.869	-	-
Title: Unmanned Logistics System-Air (ULS-A) ***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	7.961	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603648D8Z / *Joint Capability Technology Demonstration (JCTD)*	**Project (Number/Name)** 648 / *Joint Capability Technology Demonstration (JCTD)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
system (UAS) prototypes coupled with autonomous technologies to provide an organic, highly autonomous, aerial distribution capability that increases ground force agility, decreases individual carry loads, and allows the Joint Commanders to have 'on-call' control of mission essential and time-critical resupply. In FY 2020, ULS-A continued technical and operational testing on small and medium UASs and began testing of the large unmanned system. As a result of successful flight demonstrations, the USMC and Army have accelerated their acquisition of these vehicles. ULS-A will conduct flight demonstrations utilizing the large UAS configuration in support of live operational demonstrations, culminating in a military utility assessment (MUA).			
Title: Joint Negation of Asymmetric Threats (JNAT) ***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 conducted 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 demonstrated a common operating picture and reporting tool. In FY 2020, JNAT conducted a cyber-negation demonstration, demonstrated a leave-behind integrated air defense and point defense capability with a baseline adaptable C-UAS architecture, and conducted the final military utility assessment. JNAT transitioned 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. Due to COVID19 impacts, the JCTD will complete in FY 2021.	2.628	-	-
Title: Expedient and Expeditionary Airfield Damage Repair (E-ADR) ***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 also provide an expedient repair capability for aircraft runways in austere and dynamic base locations. In FY 2020, E-ADR conducted technical demonstrations. ***FY 2021 Plans:*** E-ADR conducted operational demonstrations and a final military utility assessment. E-ADR transitioned the technical package and prototypes to U.S. Naval Mobile Construction Battalions and the U.S. Air Force Life Cycle Management Center. The JCTD will complete in FY 2021. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The JCTD completed in FY 2021.	1.718	0.558	-
Title: Integrated Manufacturing Energetic Airframe (IMEA)	2.314	1.117	-

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603648D8Z / *Joint Capability Technology Demonstration (JCTD)*	**Project (Number/Name)** 648 / *Joint Capability Technology Demonstration (JCTD)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Description: Previously funded JCTD. IMEA supports the National Defense Strategy's modernization priority for joint lethality in contested environments. In FY 2020, IMEA completed an operational demonstration of integrated platform and a technical demonstration of the integrated airframe. ***FY 2021 Plans:*** IMEA conducted its military utility assessment and close out the JCTD. IMEA will transition the complete data package for the IMEA airframe, energetics formulation, manufacturing processes, and residual units for limited operational use to U.S. Army, Program Executive Office, Missiles and Space Close Combat Weapon Systems (PEO-MS CCWS). ***FY 2021 to FY 2022 Increase/Decrease Statement:*** JCTD completed in FY 2021.			
Title: Covert Long Dwell Stratospheric Architecture (COLD STAR) ***Description:*** Previously funded 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. COLD STAR will 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 2020, COLD STAR conducted operational demonstrations (OD), developed concept of operations, and participated in joint exercises. ***FY 2021 Plans:*** Completed integrated assessment plan; conducted final operational demonstration and military utility assessment (MUA) using autonomous navigation and on-board processing on a stratollite. Closed out the JCTD. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The JCTD completed in FY 2021.	5.281	1.636	-
Title: UHF Legacy Extension (ULX) ***Description:*** Previously funded 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 in 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. In FY 2020, ULX developed concept of	0.206	1.173	-

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603648D8Z / *Joint Capability Technology Demonstration (JCTD)*	**Project (Number/Name)** 648 / *Joint Capability Technology Demonstration (JCTD)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
the operations and tactics, techniques, and procedures; developed user-friendly frequency planning system and channel plan; conducted a technical demonstration (TD); and installed an operational prototype. ***FY 2021 Plans:*** Conducted operational demonstration (OD) and military utility assessment (MUA). ULX transitioned operational prototype hardware and software to the MUOS program of record (PoR). The operational prototype transitioned in place at the Wahiawa, HI Radio Access Facility to the MUOS PoR. Completed the JCTD. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The JCTD completed in FY 2021.			
Title: Directed Energy Survivable Standoff Munitions (DESSM) ***Description:*** Previously funded JCTD. 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. In FY 2020, DESSM completed their build; drafted the concept of the operations and tactics, techniques, and procedures; and began work on technical demonstrations in simulated environments. ***FY 2021 Plans:*** In FY 2021, DESSM worked on DE hardened residual munitions; assessed performance and costs data; as well as conducted their final Military Utility Assessment. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The JCTD completed in FY 2021.	5.533	4.468	-
Title: Hoku-Kai ***Description:*** Previously funded JCTD. Hoku Kai supports the USD(R&E) fully networked command, control, and communications (FNC3) 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. In FY 2020, the Hoku Kai JCTD developed integration plans; obtained environmental permits at demonstration sites; developed/delivered standard network interfaces; and conducted a preliminary and critical design review. ***FY 2021 Plans:***	4.278	3.479	-

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603648D8Z / *Joint Capability Technology Demonstration (JCTD)*	**Project (Number/Name)** 648 / *Joint Capability Technology Demonstration (JCTD)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Hoku Kai built hardware nodes in FY 2021, conducted integration tests of the nodes in classified locations, developed the end-to-end network architecture, prepared and installed the infrastructure at demonstration sites, and completed the delivery of final designs, prototypes, development tasks, and network architecture for the JCTD. The Hoku-Kai project completed in FY 2021. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The JCTD completed in FY 2021.			
Title: Multi-domain Agile Navigation and timing Network Automation (MANNA) ***Description:*** Previously funded JCTD. MANNA supports the National Defense Strategy's modernization priority on fully networked command, control and communications (FNC3). MANNA will demonstrate a global position, navigation and timing (PNT) system of laser communications (lasercom) with secure, high-rate exfiltration of intelligence data from an aerial platform to a low earth orbit space asset. In FY 2020, MANNA conducted a technical demonstration, developed concept of operations, and executed design reviews. ***FY 2021 Plans:*** MANNA conducted space-to-air and space-to-ground technical documentation; operational demonstrations; and military utility assessment (MUA). MANNA transitioned the initial capabilities document, tested results of the MUA, verification of models, and three lasercom terminals to the RC-135 program of record via the U.S. Air Force Research Laboratory. The MANNA project completed in FY 2021. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The JCTD completed in FY 2021.	5.204	1.627	-
Title: Maritime Centric Skywave Over-the-Horizon Radar (MASOR) ***Description:*** Previously funded 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 2020, MASOR acquired system specifications; site and land acquisition; finalization of transit systems plans; and installation of digital receiver. ***FY 2021 Plans:***	3.322	1.117	1.208

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603648D8Z / *Joint Capability Technology Demonstration (JCTD)*	**Project (Number/Name)** 648 / *Joint Capability Technology Demonstration (JCTD)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
MASOR conducted a full system checkout, testing, verification, validation; operational demonstration; and preparation for military utility assessment (MUA). Upon successful MUA, MASOR transitioned to the existing Relocating OTHR Texas system via Forces Surveillance Support Center. ***FY 2022 Plans:*** MASOR will deliver a fielded prototype and conduct a final (MUA). ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Funding increases slightly in order to support the MUA towards the end of the fiscal year.			
Title: Resilient Expeditionary Agile Littoral Logistics (REALL) ***Description:*** Previously funded JCTD. REALL supports the Contested Logistics mission priority area and 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 significantly less risk than traditional naval platforms due to their distributed nature. In FY 2020, REALL completed platform design, acquisition and modification; vertical take-off and landing (VTOL) kit design and development; fuel handling system design; and a technical demonstration. ***FY 2021 Plans:*** REALL completed systems integration and testing, technical demonstrations, and operational demonstrations. ***FY 2022 Plans:*** REALL will finalize the concept of operations and complete the military utility assessment. 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. REALL is scheduled to complete in FY 2022. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The JCTD will complete before the end of FY 2022, and require less than a full year of funding.	1.231	4.384	3.625
Title: Passive Optical Spectrum Control and Exploitation (POSCE) ***Description:*** POSCE was a FY 2020 new start JCTD. POSCE supports the National Defense Strategy's emphasis on command, control, communications, computers, intelligence, surveillance and reconnaissance (C4ISR) and the OUSD(R&E) prioritization of advanced electronic warfare. Additionally, this novel sensing mechanism will provide ISR updates in response to operational challenges in anti-access/area denial environments. Additional details are CLASSIFIED.	0.859	3.161	3.408

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603648D8Z / *Joint Capability Technology Demonstration (JCTD)*	**Project (Number/Name)** 648 / *Joint Capability Technology Demonstration (JCTD)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
FY 2021 Plans: In FY 2021, POSCE conducted a technical demonstration by utilizing innovative sensing methods to augment persistent Intelligence, Surveillance, & Reconnaissance (ISR) in maritime environments and along terrestrial choke points. POSCE established requirements for automated data processing and for packaging of hardware components. Lastly, the project leveraged other partner programs to develop Concept of Operations (CONOPS) and develop system functional decomposition that maps software/hardware to CONOPS requirements. ***FY 2022 Plans:*** POSCE will fabricate developmental prototypes; develop automated command, control, and data processing software; and demonstrate functionality at outdoor test ranges and during technical demonstrations. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Multiple technical demonstrations will slightly increase costs for FY 2022. This JCTD will complete in FY 2023.			
Title: Automating Indications and Warnings (I&W) for Operational Awareness (REDLINE) ***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 2020, REDLINE scaled performance to support global event detection and classification, and provided open applications, programming, and interfaces to facilitate interoperability with other command and control systems. ***FY 2021 Plans:*** REDLINE conducted further technical and operational demonstrations and developed concept of operations. ***FY 2022 Plans:*** REDLINE will conduct its military user assessment (MUA) and will transition to the Defense Intelligence Agency’s Foundational Intelligence Modernization effort as a program of record. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The military utility assessment occurs earlier in FY 2022, thereby decreasing required funds.	1.145	3.351	2.417
Title: Resilient Logistics ***Description:*** Resilient Logistics was a FY 2020 new start JCTD. Resilient Logistics supports the Contested Logistics mission priority area and the National Defense Strategy's modernization priority on forward force maneuver and posture resilience. Resilient Logistics will provide kitted solutions to increase the survivability of expeditionary and permanent logistical support networks in an Anti-Access/Area Denial (A2/AD) environment. Upon completion of the JCTD, residual operational prototype kits	1.718	1.675	3.021

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603648D8Z / *Joint Capability Technology Demonstration (JCTD)*	**Project (Number/Name)** 648 / *Joint Capability Technology Demonstration (JCTD)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
for Camouflage, Concealment, and Deception (CC&D) mission requirements will be available for immediate fielding. Technical data packages with associated concept of operations will transition to U.S. Army, Program Executive Office for Simulation, Training, and Instrumentation (PEO STRI). In FY 2020, Resilient Logistics conducted passive survivability assessments and finalized the project implementation directive. ***FY 2021 Plans:*** The project developed and finalized an intelligence assessment report that will be used to assess most effective solutions, conduct technical demonstrations (TD) of potential solutions, and execute an operationally-relevant scenario to inform the down-select of optimal solutions to be included in a combined kit. ***FY 2022 Plans:*** Develop concept of operations and tactics, techniques, and procedures for kitted solution. Conduct a comprehensive Military Utility Assessment (MUA) with operational units at an appropriate exercise venue. This JCTD will complete in FY 2022. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** MUA conducted late in the fiscal year increases costs for FY 2022. JCTD completes in FY 2022.			
Title: Analytic Threat Observation, Materialistic Identification, Classification, and Attribution (ATOMICA)	3.436	2.234	2.658
Description: ATOMICA was a FY 2020 new start JCTD. ATOMICA supports the National Defense Strategy's focus on providing non-intrusive, real time identification of threats to support the Joint Force's secure maneuverability through both land and sea. ATOMICA provides a portable, self-contained sensor system that will provide an unprecedented ability to materialistically determine the contents of an unknown object. The sensor will interrogate objects with a short standoff distance without touching, opening, or disturbing the targeted object. The ATOMICA sensor will be integrated onto various unmanned platforms, to include unmanned ground vehicles (UGV) and unmanned remotely operated, vehicles (ROV) for both terrestrial and underwater environments. ***FY 2021 Plans:*** The JCTD developed a ruggedized developmental prototype with an initial technical demonstration in a controlled environment. ***FY 2022 Plans:*** The JCTD will develop a concept of operations (CONOPS) and tactics, techniques, and procedures (TTP) for fieldable/operational prototypes. ATOMICA will also conduct a Military Utility Assessment (MUA) with warfighters in an operationally relevant environment. ***FY 2021 to FY 2022 Increase/Decrease Statement:***			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603648D8Z / *Joint Capability Technology Demonstration (JCTD)*	**Project (Number/Name)** 648 / *Joint Capability Technology Demonstration (JCTD)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
The JCTD conducted a technical and operational demonstration in FY 2021, decreasing expenditures requirements in FY 2022 to focus on the Military Utility Assessment (MUA). This JCTD will conclude in FY 2022.			
Title: Reliable Transmission over HF (NORTH) ***Description:*** NORTH was a FY 2020 new start JCTD. NORTH directly 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 2021, NORTH will conduct a technical demonstration in simulated conditions which will demonstrate an ad hoc high frequency (HF) mesh networking system that operates through a range of contested environments to enhance fully networked C3 (FNC3), including Resilient Command and Control (RC2) and Nuclear Command, Control and Communications (NC3). NORTH will integrate with the Navy's wideband HF mesh networking system and the Air Force's digital HF radios and repeaters to optimize joint information transport datalinks based on sense and respond (S&R) of the spectral environment. All three systems together provide an enterprise solution which will increase operational effectiveness of resilient C3 in anti-access/area-denial environments. ***FY 2021 Plans:*** NORTH began modeling mesh network topology; modifying software components; and complete a technical demonstration (TD) in a simulated environment. ***FY 2022 Plans:*** NORTH will conduct a TD with roll-on/roll-off (RO-RO) equipment kits in fixed and mobile platforms in spectrum contested environments. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Completion of a technical demonstration with physical roll-on/roll-off (RO-RO) equipment and mobile platforms results in increased costs for the FY 2022 operational and technical demonstrations. This JCTD will complete in FY 2023.	2.333	0.809	3.589
Title: Secure Tactical Advanced Mobile Power (STAMP) ***Description:*** STAMP was a FY 2020 new start JCTD. Legacy tactical power systems decrease combat system availability, create a vulnerable static posture, lack energy storage, lack consumption awareness, and impose unsustainable logistical requirements. To solve these problems, STAMP will integrate power generation, distribution, battery storage, metering, control systems, and on- board vehicle power from mobile tactical platforms into an AC/DC micro-grid to enhance resiliency, mobility, and flexibility of tactical units to execute distributed cross domain maneuvers in multi-domain operations. In FY 2020, STAMP conducted a technical demonstration (TD) of full vehicle micro-grid and developed a Tactical Micro-grid Standard (TMS) Micro-grid Controller (MC) for vehicles. ***FY 2021 Plans:***	1.896	5.378	2.664

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603648D8Z / *Joint Capability Technology Demonstration (JCTD)*	**Project (Number/Name)** 648 / *Joint Capability Technology Demonstration (JCTD)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Confirmed safety test result. Finalized vehicle charging (VC) Integration Design. Provided updated dashboard for Tactical Micro-grid Standard (TMS) Micro-grid Controller (MC) for vehicle charging station (VC) station. ***FY 2022 Plans:*** Operational Demonstrations for AC/DC Microgrid, mobile tactical charging and energy storage integration; transition integration; safety confirmation for Family of Medium Tactical Vehicles (FMTV) microgrid system. STAMP will transition TMS compliant components and other hardware to Programs of Record for Power Distribution Illumination System, Electrical (PDISE) and Family of Medium Tactical Vehicles (FMTV). Operational prototypes will be delivered to Program Management (PM) office Terminal High Altitude Area Defense (THAAD) and PM Mission Command. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Operational demonstration completed and reduces expenditures in FY 2022. This JCTD will complete in FY 2022.			
Title: Autonomous Maritime Patrol Craft (AMPA) ***Description:*** AMPA was a FY 2020 new start JCTD. AMPA supports the National Defense Strategy by developing an unmanned militarized version of the world's largest solar aircraft, the Solar Impulse. The resulting Skydweller aircraft will be designed to stay airborne for over 90 days with excess electrical power available to simultaneously operate a suite of Sensors, Communications, Navigation, and Electronic Warfare (EW) sub-systems. This technological leap will allow a single Skydweller aircraft to more effectively perform the mission of numerous manned & unmanned ISR/configurable assets, eliminate risk to human pilots, and provide a level of persistence not available anywhere else in the military inventory, or the world. In FY 2020, AMPA produced an Implementation Directive, conducted preliminary design reviews, and drafted initial concept of operations. ***FY 2021 Plans:*** AMPA conducted engineering activities to integrate advanced fly-by-wire technology, autonomous flight control system, and vehicle management systems into the Skydweller aircraft. Flight Readiness and Safety reviews were conducted and flight authorizations obtained. ***FY 2022 Plans:*** Execution of a technical demonstration that will demonstrate autonomous long endurance flight of the Skydweller aircraft and basic system operations. Evaluation of flight result will culminate in a decision to fund advanced sensor payload integration in the long endurance aircraft. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Full technical demonstrations in FY 2022 will result in higher costs.	0.483	1.620	2.719
Title: Automated Construction of Expeditionary Structure (ACES)	1.117	3.295	0.785

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603648D8Z / *Joint Capability Technology Demonstration (JCTD)*	**Project (Number/Name)** 648 / *Joint Capability Technology Demonstration (JCTD)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Description: ACES was a FY 2020 new start JCTD. ACES provides Combatant Commands the capability to quickly provide mobility and force protection for deployed Joint Warfighters. Military combat engineer units lack the capability to enable rapid construction, route repair and gap crossing to establish and sustain lines of communications. ACES will provide an automated 3D printer to construct gap crossings, obstacles, and force protection positions using locally available concrete and other materials at a pace that adversaries cannot match. In FY 2020, ACES delivered a ruggedized 3D concrete printer and conducted technical demonstrations with multiple services. ***FY 2021 Plans:*** Conducted blast testing, validated bridge design and conducted technical demonstrations. ***FY 2022 Plans:*** Conduct Military Utility Assessment (MUA) and deliver fieldable prototypes in theater to support Joint Warfighter battlefield needs. Prototypes will transition to Programs of Record (POR) at: 1) U.S. Army Facilities Component Systems; 2) U.S. Navy Engineering Expeditionary Warfare Center (EXWC); 3) U.S. Marine Corps Systems Command. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Operational demonstration completed, reducing expenditures. This JCTD completes in FY 2022.			
Title: JCTD Concept Development/Developmental and Operational Prototypes	0.000	10.387	42.398
Description: Continually funded effort. This funding allocation is to provide funding for fiscal year new start JCTDs. The JCTD program will select new projects as developmental and operational prototypes, in alignment with the co-developed mission focused areas that include, but are not limited to: Time-Sensitive Targeting (TST), Advanced Electronic Warfare (AEW), Fully Networked Command, Control and Communications (FNC3), Fire Support Next (FSN), Rapid Precision Strike (RPS), Contested Logistics, Assured Position Navigation and Timing (APNT), Persistent Intelligence, Surveillance, and Reconnaissance (PISR), Information Dominance (INDM), and Cyber Effects Operations (CYEFFO). 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 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 capability gaps. The JCTD office will work with the Services to identify means to streamline prototype transition into the acquisition systems where appropriate. ***FY 2021 Plans:***			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603648D8Z / *Joint Capability Technology Demonstration (JCTD)*	**Project (Number/Name)** 648 / *Joint Capability Technology Demonstration (JCTD)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Funded the follow-on efforts for projects started in FY 2020. Selected advanced prototyping activities as new starts in FY 2021 that support the National Defense Strategy and the USD(R&E) priorities. ***FY 2022 Plans:*** Fund the follow-on efforts for projects started in FY 2021. Select advanced prototyping activities as new starts in FY 2022 that support the National Defense Strategy and the USD(R&E) priorities. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The Program Element baseline shows an increase from FY 2021 to FY 2022. This line is dedicated to new start projects. During the years of execution (FY 2021 / FY 2022), once projects are selected, funding is no longer accounted in this line and is accounted for in projects detailed separately throughout the R-2A. In previous years, funding for new start projects in each fiscal year is typically 20 - 30 percent.			
Title: Combatant Commander (CCMD) Support, Capability Transition and Strategic Project Operational Management	15.701	19.983	19.926
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 time sensitive targeting (TST), electronic miniaturization, electronic countermeasures, advanced mobile ad hoc network communications, space situational awareness intelligence surveillance and reconnaissance, sensor platforms and communications, and persistence surveillance. ***FY 2021 Plans:*** Provided CCMD direct participation to enable CCMD staff participation in identifying and executing developmental and operational prototypes. Identify and execute projects selected by the prototyping senior steering group. Sustain selected projects until program of record funds are received. Execute a limited number of classified projects' military utility assessments. ***FY 2022 Plans:***			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603648D8Z / *Joint Capability Technology Demonstration (JCTD)*	**Project (Number/Name)** 648 / *Joint Capability Technology Demonstration (JCTD)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Provide CCMD direct participation to enable CCMD staff participation in identifying and executing developmental and operational prototypes. Identify and execute projects selected by the prototyping senior steering group. Sustain selected projects until program of record funds are received. Execute a limited number of classified projects' military utility assessments. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** These efforts are funded as a percentage of the PE budget. An increasing budget results in increasing funds towards these efforts.			
Title: Time-Sensitive Target Defeat Focus Area ***Description:*** This project addresses the need for distributed, rapidly-deployed capabilities that can provide persistent sensing to Find, Fix, and Finish time-sensitive threats by integrating prototypes and experiments into a series of multi-domain operational demonstrations. Demonstrations focus on evaluating how the Joint Force can leverage modernization technologies, commercial space-based capability, and operationalization of the stratosphere to refine hypersonic and long-range fire kill chains to counter time-sensitive targets. ***FY 2022 Plans:*** In FY 2022, TSTD will execute Joint-Combined Demonstration and Experimentation Campaigns (JCDEC) and TRIPPWIRE into two joint multi-domain demonstrations exercises, such as Northern Edge 21, Talisman Sabre, or Pacific Europe/Pacific Defender to evaluate prototypes and experiments operational utility in operationally relevant environments with direct warfighter involvement and feedback. Two JCDEC and TRIPPWIRE risk reduction demonstration events will be conducted prior to the exercises to ensure the prototypes and experiments are operationally feasible. A Counter-Stratospheric Operations experiment will be conducted within TRIPPWIRE. An all-domain joint demonstration will incorporate prototypes from land, air, sea, cyberspace, space, stratosphere, and electronic warfare to evaluate multi-path kill webs. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** In FY 2022, the Time Sensitive Targeting Defeat focus area is transferred from Program Element 0603338D8Z (Defense Modernization and Prototyping).	-	-	14.251
Accomplishments/Planned Programs Subtotals	87.384	71.452	102.669

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603648D8Z / *Joint Capability Technology Demonstration (JCTD)*	**Project (Number/Name)** 648 / *Joint Capability Technology Demonstration (JCTD)*

D. Acquisition Strategy

The JCTD program achieves its objectives in collaboration with the Combatant Commands (CCMDs); the Joint Services; interagency, international, and non-governmental partners to expand the DoD's access to early prototyping and innovation. JCTDs primarily address technology needs that fall into the seams between the urgent/emergent needs of CCMDs and Title-10 functions of the Military Services. The program conducts experiments and delivers developmental and operational prototypes to CCMDs, generally within two to four years. JCTDs then culminate in a sponsored military utility assessment (MUA), thus enabling scale-up of science and technology from the laboratories into Service acquisition programs. Subsequently, JCTD investments are further informed by the CCMDs' integrated priority list, the capability gaps assessed through the Joint Staff, and the Defense Department's disparate science and technology roadmaps to achieve collaborative warfighter dominance. The JCTD program looks to deliver leap-ahead operational capability in reduced time with the coordination of allied research and development (R&D) funding, technologies from service and national labs, and industry participation. The value proposition is to build affordable operational prototypes more quickly, that enable Joint/Combined forces to access novel/leap-ahead capability faster.

The JCTD program coordinates its efforts with other prototyping groups within the DoD to ensure no redundant activities are being produce that would invalidate or lessen the impact of the JCTD investment. Other organizations that help shape the JCTD proposal process include Service RCOs, Service Labs, Strategic Capabilities Office (SCO), Defense Innovation Unit (DIU), A&S Coalition Warfighter Program (CWP), Joint Staff Warfighting Lab Incentive Fund (WLIF), and the Defense Advanced Research Projects Agency (DARPA). Technologies used to create the JCTD prototypes are fully vetted through the R&E Modernization Principal Directors according to their published technology roadmaps.

Results: In FY 2020, the JCTD program aligned and initiated projects to operationalize the DoD's Modernization Priorities, leading the Department's development of early prototypes uniquely poised towards Joint, high-risk mission gaps. These efforts focused investments towards prototypes that regain our nation's technological edge against near-peers in contested environments. The JCTD Program completed four MUAs and transitioned thirteen prototype capabilities and/or select components to new or existing PoRs. Additionally, four prototypes providing early operational capabilities were directly fielded to the CCMDs and are being sustained by non-JCTD funds in operational theaters.

Between fiscal years 2016 to 2021 (to date), the Joint Capability Technology Demonstration (JCTD) Program has successfully closed-out 27 projects. These JCTD projects have directly operationalized the Department of Defense's Modernization Priorities. In addition, the JCTD Program has led the Department's development of leapahead technologies uniquely poised towards the Joint, higher-risk mission gaps, with a focus towards retaining our Nation's technological edge against near-peer adversaries in contested environments. Of these 27 closed-out JCTD projects, 20 (74%) delivered prototypes to either a Program of Record or directly into the hands of the Joint Warfighter as a capability, or significant component of a capability; five (5) (19%) prototypes or the analysis thereof quickly explored advanced and emerging technologies to better inform capability decisions without the major commitment of resources; and only two (2) (7%) projects did not meet the criteria for transition as either a capability delivery or capability enabler, and were returned to the technology base for further development. The percentage of transition type further demonstrates the success of the JCTD program to provide early capabilities to the warfighter. At times, the technology or the vision of the early capability does not meet the warfighter need or concept of operation. A success rate of 93 percent demonstrates the effective selection process, with appropriate implementation risk, to ensure the JCTD funds are not lost through extremely risky prototype concepts, thereby providing the warfighter the advanced capabilities envisioned during prototype concept creation.

THIS PAGE INTENTIONALLY LEFT BLANK

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603662D8Z / *Networked Communications Capability*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	-	2.767	5.882	2.984	-	2.984	-	-	-	-	-	-
663: *Network Communications Analysis*	-	2.767	5.882	2.984	-	2.984	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

Fielded communications infrastructure for the Department of Defense faces a variety of challenges including threats from electromagnetic, cyber, and kinetic sources among others. As more of this infrastructure becomes virtualized in cloud and embedded systems, the ability to rapidly protect and reconstitute this infrastructure is increasingly important, particularly in situations where both commercial and DoD infrastructures are used. The Network Communications Capability Program (NCCP) strives to enable such resilience with a strategy that leverages and develops rapidly reconfigurable and deployable solutions from the physical, to network, to applications layers of a communications stack. Such solutions will leverage software and hardware that are agile in their ability to be reconfigured and managed in contested environments both at the tactical edge and in the enterprise strategic contexts.

Most Department of Defense (DoD) missions are critically reliant on communications infrastructure, particularly in the context of command and control systems. The NCCP program strives to protect such critical missions at all layers of communications system functionality using a cost effective and automated approach for terrestrial, maritime, air, and space missions. Since most components of a communications system are increasingly being deployed using software, automated strategies of enabling physical layer, network layer and application layer interoperability and rapid re-configurability are critical. Thus, methods that dynamically allow multiple types of waveforms to be used in concert with multiple networking protocols, on hardware platforms that can handle a diverse set of protocols and capabilities are important. Because most of these capabilities will be delivered as communications services, the ability to analyze and rapidly reconstitute these services to manage the mission and inherent system complexities are critical, particularly when such missions are developed in large scale. Such complex system integration requires modern software and hardware practices and automated system repair capabilities to enable affordable, resilient operation in contested spectrum challenged DoD environments.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	2.858	5.882	5.946	-	5.946
Current President's Budget	2.767	5.882	2.984	-	2.984
Total Adjustments	-0.091	0.000	-2.962	-	-2.962
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-0.091	-			
• SBIR/STTR Transfer	-	-			
• Program Adjustments	-	-	-2.962	-	-2.962

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603662D8Z *I Networked Communications Capability*

Change Summary Explanation

The FY 2022 funds were realigned for higher DoD priorities.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603662D8Z / *Networked Communications Capability*	Project (Number/Name) 663 / *Network Communications Analysis*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
663: *Network Communications Analysis*	-	2.767	5.882	2.984	-	2.984	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Threats to communications systems come from a combination of sources today from electromagnetic, cyber, and kinetic to name a few. Because DoD communication systems are highly distributed, the ability to rapidly model, measure, and manage these threats in the context of missions being conducted is critical. In order to accomplish this approach, a combination of new methods must be developed, including automated and flexible methods in continuous integration and delivery of communications software, virtualized and interoperable communications layers, which can rapidly shift between DoD and commercial systems, detailed ability to model the interactions between these components, and flexible hardware solutions that can absorb a wide variety of communications protocols and techniques. Additionally, machine learning methods that enable rapid assessment and reconfiguration of communications infrastructure are of interest.

The Network Communications Capability Program (NCCP) will endeavor to accomplish the objectives for networking and communication through three areas of research. The first area is methods for interoperable composition of communications software stacks. Such methods will enable standard components from physical, networking, and applications layers to be dynamically composed, tested, and deployed to a wide variety of communications platforms across terrestrial, maritime, airborne, and space communications and networking applications. These components will be able to be modelled and composed using standard techniques that enable verification and validation of performance as well as resilience and affordable production through automation and machine learning.

The second area is development, augmentation, and leveraging of hardware communications platforms that allow a wide variety of networking and communications protocols. These platforms should be able to accommodate many types of missions and applications, information services for software defined networking and control plane management, and physical layer implementations with broadband high speed flexible physical layers that support wireless and optical solutions, both the Department of Defense (DoD) and commercial. Additionally, these hardware platforms should be able to accommodate measurement and assessment of the status of communication functions and mission performance.

The third area of the program enables modelling of communications systems and platforms that incorporate the ability to assess real time data from the communications system and compare it with regions of system performance with respect to latency and security of pre-determined system configurations. This area will make use of methods in model based systems engineering, as well as methods in verification and validation, and employ such techniques used in complex systems management including online models of systems performance.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Networked Communications Capability Program (NCCP)	2.767	5.882	2.984

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603662D8Z / *Networked Communications Capability*	**Project (Number/Name)** 663 / *Network Communications Analysis*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Description: NCCP is developing its research thrusts in three areas of interoperable automated software, flexible resilient, and virtualizable hardware, and modelling that allows real time system assessment and management. The program is collaborating with programs in the DoD services that employ these methods across a wide variety of systems, from tactical to strategic. Methods that enable technology developments to be deployed as information services which are resilient to threats from the electromagnetic spectrum as well as cyber, and kinetic sources among others will be investigated. ***FY 2021 Plans:*** Software Development: - Develop existing software elements as information service components in virtual information service cloud environment. - Demonstrate that software components can be deployed in continuous integration continuous development pipeline. Hardware Development: - Complete existing hardware integration and testing and deliver to customer funded activities. - Integrate hardware specification into information services virtual deployment environment. Modelling: - Plan for development of system model in FY 2022 that allows real-time modeling and comparison of system performance from measured data. ***FY 2022 Plans:*** Software Development: - Demonstrate instrumented performance of existing software elements as information services. - Show interaction between hardware and software elements in the cloud environment. Hardware Development: - Demonstrate how hardware is flexible enough for virtualization across a variety of different communications protocols. Modelling: - Demonstrate prototype that allows real time modeling and comparison of system performance from measured data with resilient performance. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The decrease is due to realignment of funds for transition and to emphasize upcoming DoD priorities.			
Accomplishments/Planned Programs Subtotals	2.767	5.882	2.984
N/A	0.000	0.000	0.000
Office of the Secretary Of Defense Subtotals	2.767	5.882	2.984

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603662D8Z / *Networked Communications Capability*	**Project (Number/Name)** 663 / *Network Communications Analysis*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

NCCP is working with the Navy, Army, and Air Force to integrate its components into existing communications infrastructure from tactical to strategic contexts. Flexible, reconfigurable, resilient communications infrastructure is critical to addressing existing threats to DoD communications systems while reducing cost and modernizing DoD's capability.

THIS PAGE INTENTIONALLY LEFT BLANK

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603680D8Z / *Defense Wide Manufacturing Science and Technology Program*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	939.113	251.516	245.757	134.022	-	134.022	-	-	-	-	-	-
680: *Manufacturing Science and Technology Program*	197.258	112.033	82.340	32.318	-	32.318	-	-	-	-	-	-
350: *Manufacturing Innovation Institutes*	741.855	139.483	163.417	97.704	-	97.704	-	-	-	-	-	-
351: *Manufacturing Education and Workforce Development*	-	0.000	0.000	4.000	-	4.000	-	-	-	-	-	-

Note

COVID-19 (i.e., CARES Act) Comptroller Add of $60.780 million in FY 2020 was incorrectly aligned to Project Code 680 when it was rolled into the Defense Wide Manufacturing Science and Technology (DMS&T) Program in late CY 2020. Budget lock prevents alignment correction, as part of the President's Budget FY 2022 submission. The full COVID-19 funding should have been aligned to Project Code 350.

FY 2020 $101.000 million Congressional Adds also must be aligned as managed (Project Code 680 = $22.000 million and P350 = $79.000 million).

Because COVID-19 funds are primarily executed via the Manufacturing Innovation Institutes, the correct breakout of the Total Program Element of $251.516 million, in FY 2020, is:
FY 2020 Project Code 680 = $57.162 million
FY 2020 Project Code 350 = $194.354 million ($201.015 million less SBIR/STTR Transfer of $6.661 million)

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 addresses joint, cross-cutting, and high-risk/high payoff technologies; manufacturing challenges within the DoD Modernization Priorities areas; and 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 DMS&T program objective 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 created and is sustaining a manufacturing innovation ecosystem via activities within three Program Element (PE) Project Codes: 680, Manufacturing Science and Technology Program (MSTP), 350, DoD Manufacturing Innovation Institutes (MIIs), and 351, Manufacturing Education and Workforce Development (M-EWD).

Project Code 680, Manufacturing Science and Technology Program (MSTP):

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603680D8Z *I Defense Wide Manufacturing Science and Technology Program*

The MSTP focuses on cross-cutting defense manufacturing advancements and stimulates early development of manufacturing processes and enterprise business practices.

Project Code 350, DoD MIIs:
This project supports nine DoD-led MIIs within the national Manufacturing USA network, in accordance with mission requirements. MII technology domain focus areas are: (1) additive manufacturing; (2) digital manufacturing, design, and manufacturing cybersecurity; (3) lightweight materials; (4) integrated photonics; (5) flexible hybrid electronics; (6) smart fibers and textiles; (7) advanced tissue biofabrication; (8) advanced robots for manufacturing; and (9) bioindustrial manufacturing. Each MII is a public/private partnership with members from industry, academia, and federal and state governments that together mature manufacturing processes, build out a supporting ecosystem, and provide manufacturing education and workforce development. The consortia match DoD funding at a one to one ratio (or greater). They include small and medium as well as large manufacturers and state-of-the-art pilot facilities.

Project Code 351, Manufacturing Education and Workforce Development (M-EWD):
M-EWD provides strategic leadership of advanced manufacturing talent development within the Defense Industrial Base (DIB) with three mission objectives: (1) invest in strategic education and workforce development capabilities, (2) expand the talent acquisition pool to promote diversity equity and inclusion, (3) modernize manufacturing EWD by driving action within DIB-critical regional economies with a focus on Career & Technical Education (CTE).

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	197.397	93.817	96.042	-	96.042
Current President's Budget	251.516	245.757	134.022	-	134.022
Total Adjustments	54.119	151.940	37.980	-	37.980
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	152.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-6.661	-			
• Program Adjustment	60.780	-0.060	37.980	-	37.980

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2020	FY 2021
Project: 680: *Manufacturing Science and Technology Program*		
Congressional Add: *High Temperature Carbon Composites Manufacturing*	-	7.000
Congressional Add: *Advanced Structural Manufacturing (FY20 title was "Advanced Manufacturing")*	-	7.500
Congressional Add: *Carbon Hypersonics Materials Industrial Base*	-	5.000

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603680D8Z *I Defense Wide Manufacturing Science and Technology Program*

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2020	FY 2021
Congressional Add: *HPC enabled advanced manufacturing*	17.000	17.000
Congressional Add: *Hypersonics Advanced Manufacturing Technology Center*	-	25.000
Congressional Add Subtotals for Project: 680	17.000	61.500
Project: 350: *Manufacturing Innovation Institutes*		
Congressional Add: *Program Increase*	20.000	26.000
Congressional Add: *Manufacturing Engineering Programs*	5.000	-
Congressional Add: *Flexible Hybrid Electronics (FHE) (FY20 title was "Manufacturing Innovation Institutes")*	10.000	10.000
Congressional Add: *Advanced Manufacturing*	10.000	14.000
Congressional Add: *Manufacturing Cybersecurity*	14.000	-
Congressional Add: *Silicon Based Lasers*	25.000	-
Congressional Add: *Cyber Initiatives*	-	3.000
Congressional Add: *Digital Manufacturing*	-	7.000
Congressional Add: *Additive Manufacturing Training Insertion*	-	2.000
Congressional Add: *Hypersonics Enabling Additive Manufacturing*	-	10.000
Congressional Add: *5G Manufacturing Testbed*	-	5.000
Congressional Add: *Manufacturing USA Institutes*	-	5.000
Congressional Add: *Hypersonics and Thermal Management*	-	5.000
Congressional Add: *Arsenal Supply Chain Security Proof of Concept*	-	3.500
Congressional Add Subtotals for Project: 350	84.000	90.500
Congressional Add Totals for all Projects	101.000	152.000

Change Summary Explanation

The increase in FY 2022 supports Manufacturing Education and Workforce Development and Manufacturing Innovation Institutes.
The increase in FY 2021 supports the Bioindustrial Manufacturing Innovation Institute, BioMADE.
The increase in FY 2020 is for CARES Act Funding, executed through Manufacturing Innovation Institutes to conduct diagnostics and medical research, devise medical countermeasures, develop personal protective equipment, and improve medical care.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603680D8Z / *Defense Wide Manufacturing Science and Technology Program*	Project (Number/Name) 680 / *Manufacturing Science and Technology Program*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
680: *Manufacturing Science and Technology Program*	197.258	112.033	82.340	32.318	-	32.318	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

COVID-19 (i.e., CARES Act) Comptroller Add of $60.780 million in FY 2020 was incorrectly aligned to Project Code 680 when it was rolled into the Defense Wide Manufacturing Science and Technology (DMS&T) program in late CY 2020. Budget lock prevents alignment correction. The full COVID-19 funding should have been aligned to Project Code 350.

Project Code 680 also manages $22.000 million of the FY 2020 $101.000 million Congressional Adds. The correct FY 2020 total amount for Project Code 680 is $ 57.162 million.

A. Mission Description and Budget Item Justification

The Office of the Secretary Defense (OSD) Manufacturing Science and Technology Program (MSTP) concentrates on cross-cutting defense manufacturing needs that are beyond the ability of a single service to address. The MSTP invests in broad technology initiatives within Advanced Electronics and Optics, Advanced Materials and Composites, Advanced and Emerging Manufacturing Processes, and Advanced Energetics Manufacturing.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Advanced Electronics and Optics	10.443	7.750	8.750
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 to 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.			
FY 2021 Plans: The Gradient Index Lenses, Portable X-Ray Detectors for the Dismounted Solider, Automated Assembly of Laser-Welded Fiber Optics and Circular Polarizes for Color Day Camera projects will be entering the final year of funding to carry them through the remainder of their efforts. Continue projects that are addressing manufacturing needs for electronic and optics related technologies. Initiate the Low-Cost Chip Scale Atomic Clock and Improved Photovoltaic Power for Space projects in FY 2021.			
FY 2022 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603680D8Z / *Defense Wide Manufacturing Science and Technology Program*	**Project (Number/Name)** 680 / *Manufacturing Science and Technology Program*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Fund the final year of the Low-Cost Chip Scale Atomic Clock project and Year 2 of 4 of the Improved Photovoltaic Power for Space project. Utilize the annual project call to select and initiate projects that support the National Defense Strategy and DoD modernization priorities. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Changes reflect minor budget fluctuations.			
Title: Advanced Materials and Composites ***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. ***FY 2021 Plans:*** Fund the Manufacturing of Carbon/Carbon Composites for Hypersonic Applications (MOC3HA) initiative for Year 4 of 6 and issue additional Task Orders to advance manufacturing capabilities. Additionally, the Hypersonic RF Seeker Window Manufacturing Development project will enter Year 2 of 3 and the Thermoplastic Composites project will be initiated. ***FY 2022 Plans:*** Fund the MOC3HA initiative for Year 5 of 6 and the Hypersonic RF Seeker Window and Thermoplastic Composites projects will enter their final year of funding. Utilize the annual project call to select and initiate projects that support the National Defense Strategy and DoD modernization priorities. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Increase reflects anticipated investments in a critical technology sector for Modernization Priorities to enable advanced manufacturing of published requirements.	11.490	5.870	12.900
Title: Advanced and Emerging Manufacturing Processes ***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. ***FY 2021 Plans:***	6.010	4.010	6.550

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603680D8Z / *Defense Wide Manufacturing Science and Technology Program*	**Project (Number/Name)** 680 / *Manufacturing Science and Technology Program*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
The Magnesium-Oxide Binder for Thermal Batteries and Foamable Celluloid Materials will receive their final allotments of funding in FY 2021 to carry them through to project completion. The Lightweight Hydrogen Fuel Cell project will enter Year 2 of 3 and the Deformable Mirrors for High Energy Laser project will be initiated. ***FY 2022 Plans:*** Lightweight Hydrogen Fuel Cell project will enter the final year of funding and Deformable Mirrors for High Energy Lasers will enter funding Year 2 of 3. Utilize the annual project call to select and initiate projects that support the National Defense Strategy and DoD modernization priorities. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Increase is due to the balance of projects within the portfolio (i.e., as old projects retire and new projects are initiated among the technology focus areas within the portfolio).			
Title: Advanced Energetics Manufacturing ***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. Develops techniques such as additive manufacturing, microfluidics, continuous processing, resonant acoustic mixing, robotics, etc. for production of critical energetics and supporting ingredients to ensure Department access to these materials and enable development of new, highly advanced energetic systems for improved range and performance. ***FY 2021 Plans:*** The High Density Reactive Material (HDRM) project will receive the final funding allotment in FY 2021. The Advanced Mixing for Infrared Countermeasures will enter funding Year 2 of 3. ***FY 2022 Plans:*** The Infrared Countermeasures project will be in the final year of execution in FY 2022. Utilize the annual project call to select and initiate projects that support the National Defense Strategy and DoD modernization priorities. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The funding level in FY 2022 is consistent with funding needed to incrementally fund existing projects and begin new advanced energetic manufacturing efforts.	6.310	3.210	4.118
Title: COVID-19 (CARES Act) Initiatives ***Description:*** Originally accounted for separately under line of accounting USRE_030603680D8Z_COVID19, the COVID-19 (CARES Act) Initiatives leveraged federal, state, commercial, and academic members of the DoD Manufacturing Innovation Institute (MII) national ecosystem to begin execution of 13 projects through seven DoD MIIs in response to COVID-19. These projects support manufacture of antibody and antiviral diagnostics technologies, rapid deployment of medical devices and	60.780	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603680D8Z / *Defense Wide Manufacturing Science and Technology Program*	**Project (Number/Name)** 680 / *Manufacturing Science and Technology Program*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
instrumentation, development of a range of medical countermeasures, and coordination of national efforts to accelerate secure U.S. manufacture and acceptance of critical medical supplies. Medical countermeasure projects include viral deactivation surface treatments, novel drug delivery systems, rapid production of personal protective equipment, manufacture of Natural Killer (NK) cells and virus-free red blood cells from stem cells, demand forecasting for allocation of critical medical supplies, and improving pharmaceutical industry capacity to optimize scale-up production using digital technology.			
Accomplishments/Planned Programs Subtotals	95.033	20.840	32.318

	FY 2020	FY 2021
Congressional Add: High Temperature Carbon Composites Manufacturing	-	7.000
FY 2021 Plans: Reduce the cost of preform construction and densification processes for Carbon/Carbon and Carbon/Silicon Carbide materials through process automation including densification automation, pitch crush automation, and weaving automation. Reduce the cost of inspection through digital x-ray and automated x-ray reading and advancements to computer tomography (CT) scanning capabilities as well as incorporate vision systems and automated inspection techniques.		
Congressional Add: Advanced Structural Manufacturing (FY20 title was "Advanced Manufacturing")	-	7.500
FY 2021 Plans: Continue development of advanced powder supply for cold-spray specific applications. Create a DoD-wide framework for qualification data sets to facilitate accelerated cold-spray approvals within DoD. Streamline site-installation approvals for cold spray capabilities at organic repair facilities throughout DoD.		
Congressional Add: Carbon Hypersonics Materials Industrial Base	-	5.000
FY 2021 Plans: Reduce the cost and process variability of 3D Polar weaving through full automation of the weaving process. Hypersonic boosters and thermal protection system (TPS) systems require a polar weave due to the size and pressures. Currently this is a manual weaving process.		
Congressional Add: HPC enabled advanced manufacturing	17.000	17.000
FY 2020 Accomplishments: Worked 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 bio-based feedstocks to fabricate prototypes and manufactures shelters, vehicles and other large systems for the Army and other military customers.		
FY 2021 Plans: Cyber-harden the High-Performance Computing (HPC) on the edge devices to reduce vulnerability to attacks. Investigate non-intrusive acoustic or electromagnetic (XRAY, CT) technologies during		

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603680D8Z / *Defense Wide Manufacturing Science and Technology Program*	**Project (Number/Name)** 680 / *Manufacturing Science and Technology Program*

	FY 2020	FY 2021
the print process to detect voids, bubbles, etc. Finite element model analysis with respect to the physics differences involved as prints move from small scale to large scale.		
Congressional Add: Hypersonics Advanced Manufacturing Technology Center	-	25.000
FY 2021 Plans: Establish a large-scale classified manufacturing space to demonstrate scalability of manufacturing capabilities & capacity within the hypersonics ecosystem, and reduce risk for transition to production with design for manufacturing. Naval Surface Warfare Center Crane will manage a coordinated effort that leverages Purdue University facilities (e.g., wind tunnels) to engage in development activities to advance materials and manufacturing processes required to meet hypersonics needs. Requirements include flow & design optimization of multi-material systems, additive manufacturing of disparate material systems, joining of multi-material systems and components, and sub-assembly performance testing.		
Congressional Adds Subtotals	17.000	61.500

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.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603680D8Z / *Defense Wide Manufacturing Science and Technology Program*	Project (Number/Name) 350 / *Manufacturing Innovation Institutes*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
350: *Manufacturing Innovation Institutes*	741.855	139.483	163.417	97.704	-	97.704	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

The COVID-19 (i.e., CARES Act) Comptroller Add of $60.780 million in FY 2020 was incorrectly aligned to Project Code 680 when it was rolled into the Defense Wide Manufacturing Science and Technology Program (DMS&T) program in late CY 2020. Budget lock prevents alignment correction. The full COVID-19 funding, in the amount of $60.780 million, should have been aligned to Project Code 350.

Additionally, Project Code 350 manages only $79.000 million of the FY 2020 $101.000 million Congressional Adds. Because COVID-19 funds are executed primarily via the Manufacturing Innovation Institutes, the correct FY 2020 amount for Project Code 350 is $194.354 million ($201.015 million less SBIR/STTR Transfer of $6.661 million).

A. Mission Description and Budget Item Justification

The Department of Defense (DoD) supports nine Manufacturing Innovation Institutes (MIIs), public/private partnerships that address both commercial and defense manufacturing needs within specific, defense-relevant technology areas. MIIs receive active participation and support from the military departments and defense agencies and their members. The MIIs' flexible business models and strong focus on enabling highly collaborative research and development (R&D) are catalyzing important new organizational relationships across government, industry, and academia. MIIs bring together both traditional defense and non-traditional sectors to accelerate key innovation cycles, expand U.S. industrial capability, and assist in creating resilient supply chains that will support innovative defense products.

DoD's nine MIIs are: (1) America Makes (for additive manufacturing); (2) MxD (Manufacturing times Digital, for digital manufacturing, design and cybersecurity); (3) LIFT (Lightweight Innovations For Tomorrow, for innovative processes to lightweight materials); (4) AIM Photonics (American Institute for Manufacturing Integrated Photonics, for photonic device manufacturing and packaging); (5) NextFlex (for flexible hybrid electronics manufacturing); (6) AFFOA (Advanced Functional Fabrics of America, for smart fibers and textiles); (7) BioFabUSA (for regenerative tissue manufacturing); (8) ARM (Advanced Robotics Manufacturing, for smart collaborative robotics for manufacturing); and (9) BioMADE (for biomanufacturing of non-medical materials and products).

MII funding is focused on:
• Conducting 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.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603680D8Z / *Defense Wide Manufacturing Science and Technology Program*	**Project (Number/Name)** 350 / *Manufacturing Innovation Institutes*

Each MII has a different model, with the following core tenets:
• Each MII 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 MII provides facilities to allow collaborative, precompetitive development of promising technologies and to promote the creation of stable and sustainable innovation ecosystems for advanced manufacturing.
• The partnership forming the MII must commit non-federal resources that equal or exceed the federal commitment.
• Each institute participates in the national Manufacturing USA network.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: America Makes (Additive Manufacturing)	4.806	7.674	7.800
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 benefits the DoD by enabling lifecycle cost savings and enhanced capabilities including: distributing supply chains to enable the right part in the right place at the right time; improving mission readiness by producing work aids for DoD depots; replacing long-lead time and out of production spares, and enhancing lethality through production of lighter weight and higher performing parts than could otherwise be achieved with traditional manufacturing. ***FY 2021 Plans:*** 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 project outcomes and deliverables with industry trends and other outside information sources to become a strategic leader in the additive manufacturing community. ***FY 2022 Plans:*** Continue the strategic partnership with the DoD to include additional project calls with America Makes members; education and workforce development activities, and support to DoD joint additive manufacturing activities. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Increased funding slightly to support current industry cost-matched initiatives for new projects in FY 2022.			
Title: MxD – Manufacturing times Digital (Digital Manufacturing, Design and Cybersecurity)	4.804	8.323	8.624
Description: MxD focuses on 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 analysis of data to reduce the time and cost of bringing new products to market. MxD eliminates			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603680D8Z / *Defense Wide Manufacturing Science and Technology Program*	**Project (Number/Name)** 350 / *Manufacturing Innovation Institutes*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
barriers between design, manufacturing, and sustainment by using both product data and process data in a way that is seamless and transparent. ***FY 2021 Plans:*** Continue MxD focus on: (1) future factory, 2) agile and resilient supply chain, 3) cybersecurity for manufacturing, and 4) design, product development, and system engineering. ***FY 2022 Plans:*** Continue recently awarded FY 2021 projects with the goal of advancing the cybersecurity of the manufacturing supply chain and driving new digital manufacturing technologies and capabilities across the U.S. manufacturing base. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Change reflects few new start initiatives with limited continued investment in current efforts.			
Title: LIFT – Lightweight Innovations for Tomorrow (Lightweight Innovations – materials and processes) ***Description:*** Advanced lightweight material 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 material 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. ***FY 2021 Plans:*** Plans include funding projects to support DOD and the commercial industrial base to benefit the warfighter, to expand smart manufacturing capabilities, and to develop and advance hypersonic and other DoD modernization priority capabilities, and continuing to develop education and workforce programs that will benefit the DoD and defense industrial base workforce. ***FY 2022 Plans:*** Continue executing FY 2021 initiatives such as Hypersonics and Cold Spray work. 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. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Change reflects little to no new start initiatives with limited continued investment in current efforts.	4.804	14.493	8.928
Title: AIM – American Institute for Manufacturing Photonics (Integrated Photonics Device Manufacturing and Packaging)	4.804	6.144	14.166

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603680D8Z / *Defense Wide Manufacturing Science and Technology Program*	**Project (Number/Name)** 350 / *Manufacturing Innovation Institutes*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Description: Integrated photonics manufacturing advances the promise of unprecedented interconnection between electronics and photonics that will deliver world-class performance in speed, density, and power consumption. Photonics provides 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. AIM Photonics has established an end-to-end U.S. 'ecosystem' for advancing domestic integrated photonics manufacturing, including access to a responsive integrated photonics fabrication foundry. AIM Photonics provides the world's only 300 mm silicon photonics multi-project wafer service, state-of-the-art photonics-electronics integrated design tools, and a highly advanced packaging, assembly, and testing user facility. ***FY 2021 Plans:*** Continue developing and maturing the U.S. photonics ecosystem. Collaborate with other DoD customers to leverage the AIM Photonics MII to address specific program problems. Develop an acquisition strategy to allow the institute to produce prototypes for DoD customers. Solicit, evaluate, and award a follow-on agreement for an integrated photonics institute. ***FY 2022 Plans:*** Develop new sets of components targeted at non-standard wavelengths, which are of particular interest to the DoD. Align capabilities with other special DoD needs such as chemical/ biological sensors. Continue to support efforts aligned to OUSD(R&E) modernization priorities. Maintain a robust education and workforce development program for integrated photonics. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2020 funding completed the DoD commitment of $110.000 million to AIM Photonics in the first Cooperative Agreement. FY 2022 funding reflects anticipated 'steady- state' funding that meets threshold requirements of this technology ecosystem as part of the follow-on Cooperative Agreement.			
Title: NextFlex Manufacturing Innovation Institute (Flexible Hybrid Electronics Manufacturing)	4.804	7.837	7.900
Description: Flexible hybrid electronics manufacturing involves highly tailorable devices on non-traditional, compliant substrates that combine thinned components manufactured from traditional processes with components added via "printing" processes. NextFlex invests in prototyping and scale-up of manufacturing processes for high speed pick-and-place, printed circuits, and hybrid fabrication to enable defense and commercial applications in wearable electronics, unattended sensors, integrated array antennas, medical devices, and soft robotics devices. NextFlex is also committed to continuous improvement in SWAPC (Size, Weight And Power plus Cost) for electronic systems. ***FY 2021 Plans:*** FY 2021 is the first full year of the NextFlex follow-on Cooperative Agreement, awarded in July 2020. New RD&D awards will begin in response to pending project calls. NextFlex goals include transition of at least two prototypes into defense systems in			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603680D8Z / *Defense Wide Manufacturing Science and Technology Program*	**Project (Number/Name)** 350 / *Manufacturing Innovation Institutes*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
partnership with industry member teams, and continued deployment and transition of its FlexFactor manufacturing education program from a regional to a national program. ***FY 2022 Plans:*** NextFlex will continue to mature flexible, stretchable hybrid electronics including advanced packaging and additive manufacturing technologies within their world-class pilot manufacturing line. Several RD&D projects initiated in FY 2021 will continue execution in FY 2022. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Change reflects little to no new start initiatives with limited continued investment in current efforts.			
Title: Advanced Functional Fabrics of America (Smart Fibers and Textiles) (AFFOA) ***Description:*** AFFOA accelerates transformation of the manufacture of traditional fibers, yarns, and textiles into highly sophisticated, integrated, and networked devices and systems. It is helping to convert the domestic textile industry into one differentiated by Intellectual Property (IP) and value-added technology. AFFOA mission outcomes will lead to highly functional fabrics that provide valuable services: fabrics that see, hear, sense, communicate, store and convert energy, regulate temperature, monitor health, and change color. AFFOA is translating these outcomes into new and improved textiles that benefit the warfighter as well as the commercial consumer. ***FY 2021 Plans:*** AFFOA plans to scale light-emitting diode (LED) and energy fibers, at low-rate production lengths, and incorporate them into full garment/product prototypes for monitoring physiological performance, stress, strain, and other parameters. Work with DoD Program Executive Offices (PEO) and Program Managers (e.g., PEO Soldier) to build insertion paths into programs of record. Demonstrate secure communications in an Identification Friend or Foe (IFF) application for PM Soldier Clothing Individual Equipment. Initiate a Wearable Sensors prototyping effort utilizing the Other Transaction Authority (OTA) for Prototyping vehicle. ***FY 2022 Plans:*** Enter into a new follow-on 5-7 years Assistance Instrument with the DoD. This agreement will involve a reduced but still significant strategic investment of federal funds in recognition of the 'steady-state' of AFFOA's maturity and the value it provides to the DoD. DoD Modernization Priority 'Quick Start' projects are likely to be part of the FY 2022 award. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The funding in FY 2021 completes the DoD funding commitment of $75.000 million to AFFOA. Decreased FY 2022 funding provides limited funding for a new agreement to continue DoD strategic engagement in the public/private partnership with AFFOA.	7.154	8.646	6.200
Title: BioFabUSA Manufacturing Innovation Institute (regenerative tissue manufacturing)	12.152	0.000	16.300

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603680D8Z / *Defense Wide Manufacturing Science and Technology Program*	**Project (Number/Name)** 350 / *Manufacturing Innovation Institutes*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Description: BioFabUSA advances state-of-the-art human tissue manufacturing innovations in cell and biomaterial processing, bioprinting, automation, and non-destructive testing technologies. BioFabUSA is establishing a collaboration to mature tissue-related technology across manufacturing readiness levels (MRL) 4-7, enabling post-delivery assurance of tissue identity, viability, function, and efficacy. This MII is assembling a diverse and currently fragmented collection of industry practices and institutional knowledge across many disciplines (e.g., cell biology, bioengineering, materials science, analytical chemistry, robotics, and quality assurance). ***FY 2021 Plans:*** Technical focus at a minimum is 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. ***FY 2022 Plans:*** 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 establish the initial prototype line with the newly developed technologies. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Increase restores the government's original intent, and funding profile, for the initial standup phase agreement for this institute.			
Title: Advanced Robotics Manufacturing (Smart Collaborative Robotics for Manufacturing) ***Description:*** Improve U.S. manufacturing competitiveness through advancements in the smart collaborative robotics field. Technologies developed via Advanced Robotics Manufacturing (ARM) support advanced robotics capabilities to address DoD requirements and improve U.S. manufacturer competitiveness with robotics. ARM is focusing on technologies enabling human robot interaction, and perfecting robotic adaption, learning, manipulation, autonomy, mobility, and perception. ***FY 2021 Plans:*** ARM will continue to accelerate technology in the following areas: (1) risk reduction for transition to the factory floor; (2) human-robot interaction; (3) interoperability; (4) reconfigurable, agile, and flexible robotic systems and, (5) intelligent robotic systems. ***FY 2022 Plans:*** Develop (1) methods and tools for adoption, integration, and readiness to include virtual modeling and simulation and testing; (2) user-friendly interfaces, natural language communication, and human-robot trust/safety; (3)Plug-and-play hardware and software,	12.155	5.800	10.786

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603680D8Z / *Defense Wide Manufacturing Science and Technology Program*	**Project (Number/Name)** 350 / *Manufacturing Innovation Institutes*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
utilizing open source and open architectures; (4) Modular designs, smart flexible end-effectors and sensors, automated path planning/mobility; and (5) collaborative, self-aware, machine learning/artificial intelligence techniques, and advanced computing. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Increase restores the government's original intent, and funding profile, for the initial standup phase agreement for this institute.			
Title: BioMADE Manufacturing Innovation Institute ***Description:*** The BioMADE MII promises to deliver a new class of manufacturing with domestic capabilities to manufacture critical resources with increased supply chain security. Bioindustrial 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. Bioindustrial 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. ***FY 2021 Plans:*** Establish the BioMADE MII to foster an end-to-end U.S. ecosystem for bioindustrial technologies 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 guided by a focus on ethics and biosecurity. The MII will be structured to address DoD and commercial applications. DoD will establish a strategic partnership with the BioMADE MII to define the strategic investment plan, establish initial MII membership, initiate a bioindustrial technology road mapping process for all technical focus areas, and launch projects. The MII will take steps to bring together government, industry, and academic bioindustrial capabilities to better position the U.S. relative to global competition. The BioMADE MII will also include universities and small to medium enterprises to allow them to participate in and benefit from bioindustrial manufacturing advances. ***FY 2022 Plans:*** Mature the emerging manufacturing innovation ecosystem for bioindustrial technologies. Establish pilot lines for downstream processing. Conduct road-mapping activities to inform and initiate the first project calls. Make subrecipient awards for each cost-shared project. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Increase establishes the second full increment of the government's funding profile to invest in the standup phase of this institute.	-	14.000	17.000
Accomplishments/Planned Programs Subtotals	55.483	72.917	97.704

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603680D8Z / *Defense Wide Manufacturing Science and Technology Program*	**Project (Number/Name)** 350 / *Manufacturing Innovation Institutes*

	FY 2020	FY 2021
Congressional Add: Program Increase	20.000	26.000
FY 2020 Accomplishments: Addressed a range of manufacturing challenges and gaps for DoD systems and modernization priorities. Accelerated ongoing efforts to provide earlier transition of technologies to the warfighter. Maintained DoD's strategic relationships with its nine MIIs and supported development and protection of associated supply chains. Initiated projects in auto-tuning RF filters, hypersonics challenges, wearable sensors, Joint Metal Additive Database Definition, and other specific MII-related research, design, and development (RD&D). ***FY 2021 Plans:*** Initiate projects supporting manufacturing requirements for DoD modernization priorities including 5G, microelectronics, hypersonics, directed energy, and fully networked command, control, and communications (FNC3). Enable additive manufacturing decision-making and life cycle data management. Increase the DoD strategic investment in the MIIs to improve their ability to advance research and technology, expand associated manufacturing ecosystems, and secure human capital through technology-related education and workforce development activities.		
Congressional Add: Manufacturing Engineering Programs	5.000	-
FY 2020 Accomplishments: Supported competitive grants and awards with community colleges, technical schools, and the DoD institutes that support manufacturing education and workforce development (EWD) objectives. Expanded the coalition of manufacturing EWD partners across all levels of government, industry, and academia with the MIIs at the hub. Drove change in the systems needed to accelerate development of a highly skilled advanced manufacturing workforce for the defense industrial base and the DoD.		
Congressional Add: Flexible Hybrid Electronics (FHE) (FY20 title was "Manufacturing Innovation Institutes")	10.000	10.000
FY 2020 Accomplishments: Continued technology development, technology transition, and education and workforce development (EWD) support at the NextFlex Manufacturing Innovation Institute to address DoD modernization priorities advanced through flexible hybrid electronics. ***FY 2021 Plans:*** Conduct open calls for FHE manufacturing projects relevant to commercial and DoD modernization priorities. Address FHE manufacturing, reliability, and scale-up for Connected Soldier Devices (C3), Human Monitoring, Harsh Environments (Hypersonics and Munitions), Autonomy and Communications for Unmanned Aerial Vehicles (UAVs). Improve NextFlex hub tools and capabilities to support prototyping of increasingly sophisticated FHE systems. Expand collaboration to address manufacturing development and supply chain bottlenecks. Create workforce education digital technical training course/modules.		
Congressional Add: Advanced Manufacturing	10.000	14.000

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603680D8Z / *Defense Wide Manufacturing Science and Technology Program*	**Project (Number/Name)** 350 / *Manufacturing Innovation Institutes*

	FY 2020	FY 2021
FY 2020 Accomplishments: (1) Advanced cold spray technologies through the Lightweight Innovations for Tomorrow (LIFT) Manufacturing Innovation Institute (MII); and (2) Conducted additive manufacturing training for departing veterans and other students via the America Makes MII. ***FY 2021 Plans:*** Extend University of Texas at El Paso (UTEP) Driving Research, Innovation, and Value through the (Driving Research, Innovation, and Value through Education in Additive Manufacturing) DRIVE AM program to produce a superior additive manufacturing educated military, domestic manufacturing workforce, and defense supply chain. Provide a K-PhD science, technology, engineering, and mathematics (STEM) education pipeline and business creation ecosystem using a holistic approach for developing proficiency in AM while growing local and national economies.		
Congressional Add: Manufacturing Cybersecurity ***FY 2020 Accomplishments:*** Funded core MxD activities that increased awareness of cybersecurity in manufacturing, provided small and medium manufacturers with necessary tools and technologies, and increased the number of participants in the cyber-skilled manufacturing workforce. Began a project with the Defense Logistics Agency that provided cybersecurity support to the defense manufacturing base.	14.000	-
Congressional Add: Silicon Based Lasers ***FY 2020 Accomplishments:*** Began execution against the AIM Photonics MII Cooperative Agreement. Developed high quality lasers on silicon to enable the next generation integrated photonics.	25.000	-
Congressional Add: Cyber Initiatives ***FY 2021 Plans:*** Issue a competitive call for cyber manufacturing research to develop self-adapting, resilient Operational Technology (OT) threat analysis technologies to recognize, in real-time, new threat vectors and craft novel security responses. Mature OT cyber resilience analytics leveraging high-performance data analytics resources while maintaining functional and security assurances. Perform reverse engineering of network protocols and controllers to expand the adaptability of OT threat analysis technologies.	-	3.000
Congressional Add: Digital Manufacturing ***FY 2021 Plans:*** Support the DoD Digital Engineering Strategy and use of digital representations of systems and components and digital artifacts to design and sustain national defense systems.	-	7.000
Congressional Add: Additive Manufacturing Training Insertion ***FY 2021 Plans:*** Continue the University of Texas at El Paso (UTEP) – America Makes Driving Research, Innovation, and Value through Education in Additive Manufacturing ("DRIVE AM") program to develop and	-	2.000

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603680D8Z / *Defense Wide Manufacturing Science and Technology Program*	**Project (Number/Name)** 350 / *Manufacturing Innovation Institutes*

	FY 2020	FY 2021
deliver additive manufacturing training to service members. Training includes virtual interactive, hands on implementation of 3D printers for high impact training opportunities at the Foundational, Specialty, and Authority levels.		
Congressional Add: Hypersonics Enabling Additive Manufacturing ***FY 2021 Plans:*** Conduct research on candidate geometries/ applications and materials for development of air breathing hypersonic systems. Enable additive manufacturing (AM) development efforts anchored by Ursa Major, a part of the hypersonics industrial base, which is establishing a manufacturing presence at the America Makes Youngstown campus. Focus on AM for rocket motors / propulsion components, with lines of effort in active cooling and high temperature sensor integration; modified AM machines capable of larger build volumes to reduce/eliminate joining; and collaboration with University of Texas at El Paso (UTEP) heat flux modeling and sensor integration. Efforts will expand training opportunities in connection with DRIVE AM. Articles to be prototyped with outside vendors with testing in partnership with NASA Glenn.	-	10.000
Congressional Add: 5G Manufacturing Testbed ***FY 2021 Plans:*** Expand existing MxD Manufacturing Innovation Institute dual-use testbed with additional 5G infrastructure using an open call for RD&D manufacturing use project(s) relevant to commercial and DoD modernization priorities, including Real-Time 5G Logistics with In-Transit Visibility and Manufacturing Cognitive Readiness Training and Skills Capture. Conduct programming/training to educate manufacturers, industry, and government and demonstrate 5G Future Factory Connectivity.	-	5.000
Congressional Add: Manufacturing USA Institutes ***FY 2021 Plans:*** Increase the DoD strategic investment in the MIIs to improve their ability to advance research and technology, expand associated manufacturing ecosystems, and secure human capital through technology-related education and workforce development activities.	-	5.000
Congressional Add: Hypersonics and Thermal Management ***FY 2021 Plans:*** Build on results of the LIFT Manufacturing Innovation Institute FY 2020 Hypersonics Challenge investment to increase development of hypersonic powders for manufacturing to meet DoD requirements for cross-platform system development. Coordinate requirements with the Hypersonics Working Group.	-	5.000
Congressional Add: Arsenal Supply Chain Security Proof of Concept ***FY 2021 Plans:*** Engage Army arsenals (e.g., Rock Island) to establish supply chain security pilot(s) to improve DoD Organic Industrial base supply chain resiliency. The MxD Manufacturing Innovation Institute will conduct	-	3.500

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603680D8Z / *Defense Wide Manufacturing Science and Technology Program*	**Project (Number/Name)** 350 / *Manufacturing Innovation Institutes*

	FY 2020	FY 2021
outreach activities (e.g., workshops, roadshows, assessments) to determine priorities for pilots, then issue an open call for projects to establish pilots to address the priorities identified.		
Congressional Adds Subtotals	84.000	90.500

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 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603680D8Z / *Defense Wide Manufacturing Science and Technology Program*	Project (Number/Name) 351 / *Manufacturing Education and Workforce Development*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
351: *Manufacturing Education and Workforce Development*	-	0.000	0.000	4.000	-	4.000	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Office of the Secretary Defense (OSD) promotes equity and inclusion in manufacturing careers, drives regional action to modernize manufacturing Career & Technical Education (CTE) for the U.S. industrial base, invests in strategic education and workforce development capabilities, and expands strategic leadership of advanced manufacturing human capital development.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Manufacturing Innovation Institutes	-	-	4.000
Description: The Manufacturing Education and Workforce Development (M-EWD) program builds on activities from FY 2019-2021 resourced by Project Code 350 and congressional interest items including the Manufacturing Engineering Program. Key M-EWD accomplishments include development of a strategic framework for DoD leadership of advanced manufacturing talent development, eight MII-led regional initiatives informed by labor market data profiles of regional economies, start of a pilot effort to develop an automated real-time labor market data portal, and launch of ManufacturingWorkforce.org, a dual-use digital learning platform with advanced manufacturing course offerings. ***FY 2022 Plans:*** The primary M-EWD effort will be a pilot project to expand the pool of talent and promote equity and inclusion in manufacturing careers by building upon Minority-Serving Institution (MSI) and Historically Black Colleges and Universities (HBCU) partnerships developed beginning in FY 2021. The secondary effort is a pilot project to build regional economic and talent development alliances. The initial alliance project will address skill shortages and gaps in the shipbuilding industry in southeast Virginia. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** New Project Code 351 established with $4.000 million in FY 2022 and additional out-year funding to promote a diverse and inclusive manufacturing workforce.			
Accomplishments/Planned Programs Subtotals	-	-	4.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603680D8Z / *Defense Wide Manufacturing Science and Technology Program*	**Project (Number/Name)** 351 / *Manufacturing Education and Workforce Development*

D. Acquisition Strategy

N/A

THIS PAGE INTENTIONALLY LEFT BLANK

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603699D8Z / *Emerging Capabilities Technology Development*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	437.475	105.998	0.000	0.000	-	0.000	-	-	-	-	-	-
795: *Emerging Capabilities Technology Development*	429.493	96.027	0.000	0.000	-	0.000	-	-	-	-	-	-
717: *Red Teaming*	7.982	9.971	0.000	0.000	-	0.000	-	-	-	-	-	-

Note

In FY 2021, all funding and project investment areas in the Emerging Capabilities Technology Development (ECTD) Program Element (PE) transitioned to PE 0603338D8Z Defense Modernization and Prototyping (DM&P).

A Congressional rescission of $36.000 million was enacted as part of the FY 2021 Appropriation reducing the available FY 2020 budget to $69.998 million.

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.

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.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603699D8Z *I Emerging Capabilities Technology Development*

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	109.411	0.000	0.000	-	0.000
Current President's Budget	105.998	0.000	0.000	-	0.000
Total Adjustments	-3.413	0.000	0.000	-	0.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-3.394	-			
• Program Adjustment	-0.019	-	-	-	-

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2020	FY 2021
Project: 795: *Emerging Capabilities Technology Development*		
Congressional Add: *Air Base Resilience Sensor*	5.000	-
Congressional Add: *High-Altitude Optical Reconnaissance Unit and Sensor (HORUS)*	10.000	-
Congressional Add: *Open Source Intelligence*	3.000	-
Congressional Add: *Remote Advise and Assist (RAA) Technology Development*	8.000	-
Congressional Add: *Artificial Intelligence Enabled Sensor Network*	10.000	-
Congressional Add Subtotals for Project: 795	36.000	-
Congressional Add Totals for all Projects	36.000	-

Change Summary Explanation

A Congressional rescission of $36.000 million was enacted as part of the FY 2021 Appropriation reducing the available FY 2020 budget to $69.998 million.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603699D8Z / *Emerging Capabilities Technology Development*	Project (Number/Name) 795 / *Emerging Capabilities Technology Development*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
795: *Emerging Capabilities Technology Development*	429.493	96.027	0.000	0.000	-	0.000	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In FY 2021, all resources in this project were transferred to the Defense Modernization and Prototyping Program Element (0603338D8Z). There were no new projects and only FY 2020 close out activities are reported.

$31.000 million of the Congressional rescission was applied to Project Code 795 Emerging Capabilities Technology Development reducing the available FY 2020 budget to $65.027 million.

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 2020	FY 2021	FY 2022
Title: FY 2020 Congressional Rescission ***Description:*** Congressional rescission applied to Project Code 795 Emerging Capabilities Technology Development.	31.000	-	-
Title: Tactical High-speed Offensive Ramjet for Extended Range (THOR-ER) ***Description:*** The THOR-ER project will develop and demonstrate a full-scale missile prototype incorporating advanced solid fuel ramjet technologies culminating in a series of operationally relevant flight demonstrations. THOR-ER is a co-development effort partnering with the U.S. Navy; the Norwegian Defence Research Establishment; and the Norwegian industrial base partner, Nammo, to enable leap-ahead gains in missile range and cruise speed while maintaining form factors similar to currently fielded solid fuel rocket motor systems. Technology developed as part of the THOR-ER project will enhance the affordability and survivability of next generation weapon systems. In FY 2020, THOR-ER completed the preliminary design and testing of initial proof-of-concept test articles in preparation for FY 2021 flight tests. In FY 2021, THOR-ER transitions to Program Element 0603338D8Z Defense Modernization and Prototyping for further development.	1.380	-	-
Title: SCIFIRE Aircraft Integration	1.400	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603699D8Z / *Emerging Capabilities Technology Development*	**Project (Number/Name)** 795 / *Emerging Capabilities Technology Development*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Description: The SCIFIRE Aircraft Integration project conducted system engineering activities to include conceptual systems analysis, modeling and simulation, and wind tunnel test preparations to validate compatibility of the proposed hypersonic weapon system prototype on a fourth-generation fighter aircraft. SCIFIRE Aircraft Integration is a co-development effort partnering with the U.S. Air Force, U.S. Navy, and a partner nation to prototype and demonstrate a hypersonic weapon system. In FY 2020, early-stage activities required to support store separation wind tunnel testing in the partner nation were completed. In FY 2021, SCIFIRE Aircraft Integration activities will transition to Program Element 0604331D8Z Rapid Prototyping Program for further development. Additional details are classified.			
Title: Fully Networked Command, Control, and Communications (FNC3) Universal Command & Control (UC2)	2.119	-	-
Description: The FNC3 UC2 project addresses the Secretary of Defense priority for integrated communications and networking. UC2 will provide an interface that enables future commanders to dynamically connect any sensor in any domain to any shooter. By focusing on a DoD-wide standard for the data layer of machine-to-machine (M2M) Command and Control (C2), the project will develop and demonstrate an efficient, evolvable, and broadly applicable standard to increase the interoperability, flexibility, and resiliency of FNC3 systems. Aligned with the Joint All-Domain Command & Control (JADC2) concept, UC2 compliant systems will dynamically respond by forming new systems and system combinations to address unanticipated, asymmetric, and evolving threats. The FNC3 UC2 project will provide warfighters faster access to new capabilities, while simplifying development and sustainment lifecycles, and lower operating and training costs. In FY 2020, the FNC3 UC2 project, in coordination with the Joint Staff, Services, Defense Agencies, and Combatant Commands, completed development of the baseline UC2 standard language and began initial planning and preparation for a FY 2021 demonstration. In coordination with the Executive Agent of the Joint Counter small Unmanned Aircraft Systems (C-sUAS) Office, C-sUAS was selected as the initial capability area to demonstrate the utility of UC2 compliant systems. As stated in Section 164 of the FY 2021 NDAA, C-sUAS requires the flexibility to continuously integrate different types of sensors and mitigation solutions to adapt to the different demands of particular military installations, physical geographies, and threat profiles. In FY 2021, the FNC3 UC2 project transitions to PE 0603338D8Z Defense Modernization and Prototyping for further development.			
Title: Self Forming Kill Chains (SFKC)	1.509	-	-
Description: The SFKC project developed and demonstrated autonomous decision aids leveraging artificial intelligence/machine learning (AI/ML) to optimize the employment of Intelligence, surveillance and reconnaissance (ISR) and effects resources across domains at machine speed for combat units at the tactical level. In FY 2020, SFKC developed initial decision aides and began implementation in a realistic modeling and simulation environment to assess effectiveness in Joint All Domain Command and Control (JADC2) and U.S. Army Multi-Domain Operations (MDO) scenarios. Work continues in FY 2021 using FY 2020 funds to finalize the development of the autonomous decision aides, and demonstrate them in a modeling and simulation environment.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603699D8Z / *Emerging Capabilities Technology Development*	**Project (Number/Name)** 795 / *Emerging Capabilities Technology Development*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
The developed source code will transition to the U.S. Army and other Department of Defense partners in FY 2021. Additional details are classified.			
Title: Project 7905 ***Description:*** This is a classified program. Additional information is available upon request. In FY 2021, Project 7905 transfers to PE 0603338D8Z Defense Modernization and Prototyping.	2.000	-	-
Title: Mission Engineering for Optimized Warfighting ***Description:*** Mission Engineering for Optimized Warfighting leverages modeling and simulation, wargaming, intelligence forecasts, mission design, and mission engineering activities to rapidly assess future Joint Warfighting Concepts. Mission Engineering for Optimized Warfighting deconvolves Joint Warfighting Concepts into core capabilities assessing how each capability aligns to achieve the overall mission objective. Results of these analyses inform future technology and capability investment decisions.	3.153	-	-
Title: Polar Skywave Radar (PSR) ***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 matured 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 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 2020, PSR continued data collection, radar signal processing refinement, HF communication experimentation, and evaluated predicted operational performance. Work continues in FY 2021 using FY 2020 funds to complete data collection, and radar signal processing refinements. In FY 2021, PSR transitions to the U.S. Air Force Life Cycle Management Center (LCMC) for further development.	1.250	-	-
Title: Blast Mitigation in Composite Structures ***Description:*** The Blast Mitigation in Composite Structures project is a co-development effort partnering with the U.S. Navy and India to explore and develop novel blast mitigation techniques for the protection of U.S. Navy vessels and U.S. Marine Corps vehicles. In FY 2020, modeling and simulation (M&S) was performed to evaluate and predict the response of novel composite structures when exposed to blast loading. Work continues in FY 2021 with FY 2020 funds to validate the response of numerous novel blast mitigating techniques through additional M&S and experimentation. In FY 2021, the project transitions to the U.S. Navy for further development.	1.650	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603699D8Z / *Emerging Capabilities Technology Development*	**Project (Number/Name)** 795 / *Emerging Capabilities Technology Development*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: FNC3 Communications & Networking Infrastructure (C&NI) BAA Task Area #3 ***Description:*** This project executes prototyping activities to mature communication concepts that enable multi-domain communications. Prototyping activities focus on increasing communications resiliency to tactical and strategic assets. Prototype systems will inform the development of Service-specific solutions required to provide fully-networked, command, control, and communications (FNC3). In FY 2020, six concepts were explored prior to down-selection for rapid maturation. In FY 2021, work continues with FY 2020 funds to continue maturing the system design and begin initial prototype development. Prototype development transitions to the U.S. Navy in FY 2021 to complete prototype development and demonstration by FY 2024. Additional details are classified.	4.566	-	-
Title: Multi-domain Experimentation and Demonstration Venues ***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 Department of Defense (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. In FY 2020, Thunderstorm, Stiletto, and other venues conducted ten demonstration and experimentation events which featured 187 innovative technologies from focus areas including, near-field communications systems, machine learning on unmanned systems, and cyber security on maritime vessels. Seven of the technologies transitioned directly to DoD operational users or were leveraged by formal programs of record, including, vertical takeoff and landing unmanned autonomous vehicles (UAVs), virtual reality training for aircrew, and a sense-through the-wall radar system. The demonstration and experimentation venues also provided 72 small businesses and non-traditional innovators with warfighter feedback critical to rapidly mature their technologies into viable prototypes. In FY 2021, Multi-domain Experimentation and Demonstration Venues transfers to the Defense Modernization and Prototyping (DM&P) Program Element, 0603338D8Z.	5.000	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603699D8Z / *Emerging Capabilities Technology Development*	**Project (Number/Name)** 795 / *Emerging Capabilities Technology Development*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Silent Hammer (SH)	5.000	-	-
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. The Joint Electronic Advanced Technology (JEAT) Program Element, 0603618D8Z supports the experiment concept development and planning efforts for SH events, while the Emerging Capabilities Technology Development (ECTD) Program Element, 0603699D8Z supports SH experiment execution efforts. In FY 2020, SH completed the concept development and experimenter outreach phases; conducted the Concept Development Meeting; and prepared for the experiment-planning phase by coordinating efforts for the Initial Planning Meeting. In FY 2021, SH transfers to the Defense Modernization and Prototyping (DM&P) Program Element, 0603338D8Z for further development.			
Accomplishments/Planned Programs Subtotals	60.027	-	-

	FY 2020	FY 2021
Congressional Add: Air Base Resilience Sensor	5.000	-
FY 2020 Accomplishments: The Air Base Resilience Sensor project directly supports the National Defense Strategy's priority for increased lethality prototyping and integrating an advanced sensor system concept to enhance detection and tracking of threat systems. Previous resources provided above the President's budget in FY 2016, FY 2017, FY 2018, and FY 2019 developed an advanced sensor chip assembly (SCA) and prototype test unit incorporating the SCA to enable experimentation and validation of expected performance in maritime environments, targeting a FY 2022 system demonstration in an operationally relevant environment. In FY 2020, prototyping activities integrated the SCA into multi-function test units to validate expected performance for other operational concepts. Work continues in FY 2021 using FY 2020 funds to identify planned FY 2022 exercises and test events that can be leveraged to validate expected performance for operational concepts of interest to the Services and Combatant Commands. This technology area is a congressional interest item and additional resources were provided above the President's budget. Details of this project are classified.		
Congressional Add: High-Altitude Optical Reconnaissance Unit and Sensor (HORUS)	10.000	-
FY 2020 Accomplishments: The HORUS prototype supports day or night operations by providing multi-spectral, high-definition full motion video from extreme slant ranges. In FY 2020, the sensor design was completed and fabrication of two prototype HORUS units began in early September. The HORUS system is		

	FY 2020	FY 2021
being designed, built, and evaluated as a prototype capability for a high-altitude sensor system with military utility for the joint warfighter. HORUS is an electro-optical prototype system designed to support pattern of life analysis at extreme distances. In addition, its modular design will allow for HORUS to be adaptable to evolving mission needs and new sensor technologies. HORUS is designed to interface with manned or unmanned platforms. In FY 2020 prototype development continued with procurement of the majority of long lead items, and completion of the Critical Design Review. Work continues in FY 2021 using FY 2020 funds to complete prototype fabrication and testing prior to transitioning to USSOCOM for final evaluation and operational use.		
Congressional Add: Open Source Intelligence ***FY 2020 Accomplishments:*** 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 demonstrated a novel Open Source Intelligence capability to support DoD modernization areas. The capability developed transitioned to the U.S. Army and U.S. Special Operations Command for further development. 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 (RAA) Technology Development ***FY 2020 Accomplishments:*** RAA directly supports critical decision and coordination processes enabling increased survivability for the joint warfighter and partners. In FY 2020, the RAA project developed and validated system performance for RAA prototypes to provide threat detection and classification of airborne and ground-based threats in operationally relevant environments. The prototypes developed transitioned to the U.S. Army and U.S. Special Operations Command for further development. 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 ***FY 2020 Accomplishments:*** This project directly supports the DoD Artificial Intelligence (AI) and Machine Learning (ML) modernization area. In FY 2020, the project developed and demonstrated an AI-based architecture reducing warfighter cognitive burden and streamlining decision-making at the tactical edge. Leveraging a network of state-of-the art digital sensors and real-time signal and image processing, the prototype demonstrated how expedient processing and distribution of data at the tactical edge reduces latencies, improves data reliability, and enhances the data-to-decision workflow at the warfighter level providing unparalleled informational advantages and decision-making capabilities. The prototype transitioned to the U.S. Army and	10.000	-

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603699D8Z / *Emerging Capabilities Technology Development*	**Project (Number/Name)** 795 / *Emerging Capabilities Technology Development*

	FY 2020	FY 2021
U.S. Special Operations Command for further development. This technology area is a congressional interest item and additional resources were provided above the President's budget.		
Congressional Adds Subtotals	36.000	-

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.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603699D8Z / *Emerging Capabilities Technology Development*	Project (Number/Name) 717 / *Red Teaming*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
717: *Red Teaming*	7.982	9.971	0.000	0.000	-	0.000	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In FY 2021, all resources in this project are transferred to the Defense Modernization and Prototyping Program Element (0603338D8Z).

$5.000 million of the Congressional rescission was applied to Project Code 717 reducing the available FY 2020 budget to $4.971 million.

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 2020	FY 2021	FY 2022
Title: FY 2020 Congressional Rescission ***Description:*** Congressional rescission applied to Project Code 717 Red Teaming.	5.000	-	-
Title: Red Teaming to Support DoD Modernization Priorities ***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,	2.221	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603699D8Z / *Emerging Capabilities Technology Development*	**Project (Number/Name)** 717 / *Red Teaming*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
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. In FY 2020, red teaming efforts were conducted to support the National Defense Strategy's priority for increased lethality and forward force maneuver, and the Department of Defense's modernization priorities for cyber, artificial intelligence, and contested logistics. A prototype was developed and assessed for cyber vulnerabilities by an associated red teaming event with operationally-experienced participants. Exploit chains were developed to inform stakeholders of real-world security impacts of deploying a system. An experiment was conducted using a low-altitude, low-speed aircraft and sensor helmet to assess radar vulnerabilities for personnel recovery. Maturing technologies, in support of artificial intelligence and contested logistics, 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.			
Title: "Hack the Sat" Satellite Hacking Event ***Description:*** The "Hack the Sat" project challenged public teams to compete and hack their way through a ground station and satellite to recover a simulated stolen space vehicle. The event was designed to attract a large, non-traditional performer base to consider cyber security challenges as they relate to space systems. In FY 2020, the project executed sensor development, data collection, integrity management, and tactics analysis for the Hack the Sat Capture the Flag event. During the event, all data generated within the competition environment was collected and analyzed to ensure fair play, create a public record of the event, and enable future analysis of novel tactics, techniques, and procedures. Work continues in FY 2021, using FY 2020 funds, to plan and execute a government-only, red-team vs blue-team event to explore additional attack pathways and defensive mitigations in a controlled environment. In FY 2021, the project plans to enhance the realism of the competition infrastructure, including the ground segment and flatsat, and transition the infrastructure to the Persistent Cyber Training Environment. After the red-team vs blue-team event, draft tactics manuals for red teaming space systems and conducting defensive cyberspace operations on space systems will transition to the United States Space Force. Additionally, recommendations on mitigations of cyber vulnerabilities in space systems will transition to the Joint Federated Assurance Center.	2.750	-	-
Accomplishments/Planned Programs Subtotals	9.971	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603699D8Z / *Emerging Capabilities Technology Development*	**Project (Number/Name)** 717 / *Red Teaming*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603716D8Z *I Strategic Environmental Research and Development Program (SERDP)*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	493.827	69.914	85.429	51.863	-	51.863	-	-	-	-	-	-
470: *Strategic Environmental Research and Development Program (SERDP)*	493.827	69.914	85.429	51.863	-	51.863	-	-	-	-	-	-

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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	66.157	53.862	49.080	-	49.080
Current President's Budget	69.914	85.429	51.863	-	51.863
Total Adjustments	3.757	31.567	2.783	-	2.783
• Congressional General Reductions	-	-0.033			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	31.600			
• Congressional Directed Transfers	-	-			
• Reprogrammings	3.757	-			
• SBIR/STTR Transfer	-	-			
• Climate Adaptation Enhancements	-	-	2.783	-	2.783

Change Summary Explanation

Realigned funds to meet National Defense Strategy priorities. Increase in FY 2022 for climate adaptation enhancements.

The Congressional add in FY 2021 are for PFAS remediation and disposal technology, AFFF replacement, disposal, and cleanup technology, PFAS innovation award fund, and PFAS/PFOA response.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603716D8Z / *Strategic Environmental Research and Development Program (SERDP)*	Project (Number/Name) 470 / *Strategic Environmental Research and Development Program (SERDP)*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
470: *Strategic Environmental Research and Development Program (SERDP)*	493.827	69.914	85.429	51.863	-	51.863	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

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 2020	FY 2021	FY 2022
Title: Environmental Restoration (ER)	22.242	38.968	13.595
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 2021 Plans: Continue research on developing improved methodologies and technologies for managing PFAS contamination at DoD sites and investigation of forensic methods to ascertain origins of PFAS contamination, further develop technologies to improve sustainability of munitions constituent use on testing and training ranges, and improve methodologies for managing contaminated groundwater.			
FY 2022 Plans: Emphasis in this Program Area will continue to be heavily focused on PFAS contamination. Efforts addressing potential remediation technologies will continue as projects devoted to understanding destruction technologies, both thermal and non-thermal, will increase.			
FY 2021 to FY 2022 Increase/Decrease Statement:			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603716D8Z / *Strategic Environmental Research and Development Program (SERDP)*	**Project (Number/Name)** 470 / *Strategic Environmental Research and Development Program (SERDP)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Continue emphasis on issues related to PFAS contamination at DoD installations. The decrease is the result of planned program changes in OUSD (A&S), and the one-time Congressional increase in FY 2021.			
Title: Munitions Response (MR) ***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. ***FY 2021 Plans:*** 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. ***FY 2022 Plans:*** Efforts in FY 2022 will begin to focus on multi-sensor platforms for underwater UXO detection and identification as well as algorithms to fuze multiple data sets collected from different platforms. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The decrease is the result of planned program changes in OUSD (A&S). Reprioritization of funding to PFAS remediation (ER) and alternative formulations for AFFF (WP).	9.729	5.348	5.035
Title: Resource Conservation and Resiliency (RC) ***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. ***FY 2021 Plans:*** Mature the fire science required for management of DoD test and training ranges. Develop planning tools aimed at resilient installations. ***FY 2022 Plans:*** Work will continue on technologies and methods to address wildland fire on DoD installations. Efforts on understanding the impacts of invasive species on strategic mobility will mature as will models for installation infrastructure resilience in response to multiple stressors. ***FY 2021 to FY 2022 Increase/Decrease Statement:***	19.458	14.423	20.141

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603716D8Z / *Strategic Environmental Research and Development Program (SERDP)*	**Project (Number/Name)** 470 / *Strategic Environmental Research and Development Program (SERDP)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
The increase is for climate adaptation enhancements will be used for additional projects focusing on climate sustainability of installation infrastructure.			
Title: Weapons Systems and Platforms (WP) ***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. ***FY 2021 Plans:*** Increased emphasis on development of alternative Aqueous Film Forming Foam (AFFF) formulations that do not contain PFAS and alternative fire-fighting technologies that do not employ foams. Continued emphasis on predictive modelling and enhanced testing related to corrosion of DoD weapons systems. ***FY 2022 Plans:*** Projects on alternative delivery methods for fire-fighting formulations will mature. Focus on new corrosion resistant coatings as the regulatory and ESOH environment makes current solutions unavailable or dramatically more expensive. Continued work on sustainable energetics with higher performance than existing formulations. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The decrease is the result of planned program changes in OUSD (A&S), and one-time Congressional increase in FY 2021.	18.485	26.690	13.092
Accomplishments/Planned Programs Subtotals	69.914	85.429	51.863

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603727D8Z / *Joint Warfighting Program (JWP)*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	48.874	4.532	3.869	2.169	-	2.169	-	-	-	-	-	-
727: *Joint Warfighting*	48.874	4.532	3.869	2.169	-	2.169	-	-	-	-	-	-

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 mission engineering integration management, as well as other high priority emerging issues requiring independent analysis to inform acquisition decisions that impact National Security.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	4.846	3.871	3.994	-	3.994
Current President's Budget	4.532	3.869	2.169	-	2.169
Total Adjustments	-0.314	-0.002	-1.825	-	-1.825
• Congressional General Reductions	-	-0.002			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Program Adjustments	-0.314	-	-1.825	-	-1.825

Change Summary Explanation

The $-1.825 million program adjustment in FY 2022 is due to internal realignments of funds within the department for National Defense Strategy priorities.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603727D8Z / *Joint Warfighting Program (JWP)*	Project (Number/Name) 727 / *Joint Warfighting*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
727: *Joint Warfighting*	48.874	4.532	3.869	2.169	-	2.169	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

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 mission engineering integration management, as well as other high priority emerging issues requiring independent analysis to inform acquisition decisions that impact National Security.

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 2020	FY 2021	FY 2022
Title: Acquisition Analysis for Joint Capability Requirements	4.532	3.869	2.169
Description: Small Satellite Coordinating Activity: - SSCA Phase 3 is kicked off in June 2020 to develop an integrated SmallSat and related technology roadmap and strategy for implementation and maintenance. - Focus groups have organized to mature the technical and nontechnical areas of the roadmap led by “volunteer” DoD organizations and deliver an assessment of their landscape and recommendations detailing critical needs for Department investment. -Established critical ecosystem partnerships across the national security community. -Established an on-going and highly impactful working group activity that will continue to inform Department efficiencies and objectives.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603727D8Z / *Joint Warfighting Program (JWP)*	**Project (Number/Name)** 727 / *Joint Warfighting*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
-Revised and matured the SmallSat Roadmap such that it can begin to directly inform OUSD(A&S) priorities for Future Years Defense Program 2022-2026. Mission Engineering Data Modeling in Strategic Portfolio Reviews: -Provided Mission Engineering Data Modeling and Characterization to support OSD Cost Assessment and Program Evaluation (CAPE) and Joint Staff Strike Strategic Portfolio Review (SPR). Identified minimum set of critical data types and developed a pilot case for authoritative data modeling that is repeatable and scalable for mission capability portfolio management. -Continued development of the Mission Universal Specification Environment (MUSE) mission engineering application. Based on pilot case from the SPR, integrated user models to support machine learning and provide automation in the MUSE User Interface. -Delivered initial automated task extraction methodology and started coding in MUSE to facilitate automatic population of warfighter task information (e.g. Uniform Joint Task Lists) into the MUSE database. -Continued Agile development sprints in progress toward a MUSE/Mission Engineering and Integration (ME&I) presentation and demo for senior leadership in September (may be delayed/extended to October due to COVID-19 impacts). Mission Engineering (ME) Capabilities Development: -Developed technical ME analytical framework (the effects/kill-chain framework) and application tool (MUSE). Integrated analytical tools to identify and exploit opportunities for interoperability with potential allied partners. - Executed three bi-monthly agile development sprints and implemented a New Agile Sprint “Drum Beat” to complete development and delivery of a MUSE Proof of Concept. -Redesigned MUSE to utilize prior and its data sources as an example/use case to demonstrate the MUSE proof of concept with additional functionality. -Developed a draft Program Agreement (PA) for U.S.-AUS Analytics and Decision Support for Force Design and Development. Mission Engineering-Automate Effects/Kill Chain & Architecture Products into M&S tools:			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603727D8Z / *Joint Warfighting Program (JWP)*	**Project (Number/Name)** 727 / *Joint Warfighting*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
-This line funded development of an automated methodology to execute Mission Engineering and Integration to transition from static architectures to executable dynamic models for time-dependent assessments of complex operations. -Developed prototype plan for methodology and tools to develop and assess Mission Effects Chain (MEC) using a model-based systems engineering approach combined with automation technologies. The plan leveraged existing methodology and tools, including technologies developed and matured under the Navy's Small Business Innovation Research program. The prototype plan also provided an initial Cost Estimate of the work required to develop a framework for department-wide mission engineering approaches and practices. -Began implementation of an initial MEC model prototype to characterize the behavior of multi-platform combat scenario. The model prototype includes MEC behavior, interfaces (messages & data), and system requirements/metrics that support trade studies and test objectives. -Began building an initial MEC Automated Test and Retest (ATRT) prototype that uses the MEC model as the basis for automated analysis from recorded data. Cyber Resilience Wargames: -Wargame was conducted in support of USINDOPACOM and assessed the cyber risk to Wideband Global Satellite Communication working group in a contested cyber environment. Key participating organizations included USSTRATCOM, USCYBERCOM, USSPACECOM, Army Space and Missile Defense Command, and the National Reconnaissance Office. Results are classified. -Cyber Invictus Wargame was conducted in support of USCYBERCOM and assessed the capability and capacity of the Cyber Protection Teams within the Cyber Mission Force. Key participating Combatant Commands include: USSPACECOM, USSTRATCOM, USEUCOM, USCENTCOM, USINDOPACOM, USTRANSCOM. Results are classified. 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. ***FY 2021 Plans:***			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603727D8Z / *Joint Warfighting Program (JWP)*	**Project (Number/Name)** 727 / *Joint Warfighting*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
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: -Mission Engineering Effects/Kill Chain Development to build effects/kill chains as part of foundational framework for the Mission Engineering and Integration Approach. -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. -Mission Engineering analysis to develop a methodology to transition from static architectures to executable dynamic models for time-dependent assessments of complex operations. -Adaptive Acquisition Framework (AAF) Pathway analysis to develop and implement a system of metrics specific or unique to each of the pathways within the Department of Defense's AAF. -Comprehensive Data Strategy is a field study and prototyping of a human-centered system to integrate, analyze, and share acquisition data for portfolio and cross-portfolio decisions. This effort will provide a baseline for sourcing a capability that supports these tasks across the DoD. -Small Satellite Coordination Activity effort is to optimize efficiencies and productivity in defense spending by executing critical technical, systems engineering, and program management oversight tasks based on a sound technical foundation in network design, architecture development, systems engineering and net-centric operations. -Software Development effort is to develop system and waveform concepts for close proximity secure satellite communications, which includes determination of the high level requirements and the threat environment such a system may face. Furthermore, this effort will explore techniques to implement secure software updates for remote embedded systems. This effort will ensure end to end software integrity, automation of software updates, and verification of security. -Space Command and Control (C2) Independent Review: NDAA-directed task, SASC FY 2020 NDAA Committee Rpt 116-14 directed the USD(A&S) to enter into an agreement with a federally funded research and development center (FFRDC) to review the Air Force's Space C2 program and submit the final report to the congressional defense committees. -Small Satellite Coordination Activity (SSCA): JWP funding supported SSCA Phase 2 and Phase 3 with focus on nine mission areas for further development. Each mission area is developing a roadmap for continued development.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603727D8Z / *Joint Warfighting Program (JWP)*	**Project (Number/Name)** 727 / *Joint Warfighting*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
-Provide in-depth nuclear weapons technical, engineering, integration support, system of system engineering analysis, nuclear cert and testing analysis for nuclear weapons activities to monitor nuclear modernization and nuclear sustainment. -Perform research and analysis in support of strategic arms control implementation planning oversight responsibilities. Evaluate DoD Component program plans to identify arms control treaty compliance issues of concern and advises on options for maximizing warfighter capabilities within legal constraints of existing arms control agreements. -Implement an adaptive acquisition framework to streamline the acquisition process and enable program execution. -Establish and refine capability portfolio management practices and processes to promote efficiency, integration, and effective end-to-end capabilities. -Implement execution and procurement of Missile Defeat and Defense Enhancements to improve the capacity and capabilities of interceptors. ***FY 2022 Plans:*** 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: -Mission Engineering Effects/Kill Chain Development to build effects/kill chains as part of foundational framework for the Mission Engineering and Integration Approach. -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. -Mission Engineering analysis to develop a methodology to transition from static architectures to executable dynamic models for time-dependent assessments of complex operations. -Adaptive Acquisition Framework Pathway analysis to develop and implement a system of metrics specific or unique to each of the pathways within the Department of Defense's Adaptive Acquisition Framework.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603727D8Z / *Joint Warfighting Program (JWP)*	**Project (Number/Name)** 727 / *Joint Warfighting*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
-Comprehensive Data Strategy is a field study and prototyping of a human-centered system to integrate, analyze, and share acquisition data for portfolio and cross-portfolio decisions. This effort will provide a baseline for sourcing a capability that supports these tasks across the DoD. -Small Satellite Coordination Activity effort is to optimize efficiencies and productivity in defense spending by executing critical technical, systems engineering, and program management oversight tasks based on a sound technical foundation in network design, architecture development, systems engineering and net-centric operations. -Software Development effort is to develop system and waveform concepts for close proximity secure satellite communications, which includes determination of the high level requirements and the threat environment such a system may face. Furthermore, this effort will explore techniques to implement secure software updates for remote embedded systems. This effort will ensure end to end software integrity, automation of software updates, and verification of security. -Space C2 Independent Review: NDAA-directed task - SASC FY 2020 NDAA Committee Rpt 116-14 directed the USD(A&S) to enter into an agreement with a FFRDC to review the Air Force's Space C2 program and submit the final report to the congressional defense committees. -Small Satellite Coordination Activity (SSCA): JWP funding supported SSCA Phase 2 and Phase 3 with focus on nine mission areas for further development. Each mission area is developing a roadmap for continued development. -Provide in-depth nuclear weapons technical, engineering, integration support, system of system engineering analysis, nuclear certification and testing analysis for nuclear weapons activities to monitor nuclear modernization and nuclear sustainment. -Perform research and analysis in support of strategic arms control implementation planning oversight responsibilities. Evaluate DoD Component program plans to identify arms control treaty compliance issues of concern and advises on options for maximizing warfighter capabilities within legal constraints of existing arms control agreements. -Implement an adaptive acquisition framework to streamline the acquisition process and enable program execution. -Establish and refine capability portfolio management practices and processes to promote efficiency, integration, and effective end-to-end capabilities.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603727D8Z / *Joint Warfighting Program (JWP)*	**Project (Number/Name)** 727 / *Joint Warfighting*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
-Implement execution and procurement of Missile Defeat and Defense Enhancements to improve the capacity and capabilities of interceptors. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** 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.			
Accomplishments/Planned Programs Subtotals	4.532	3.869	2.169

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603769D8Z / *Advanced Distributed Learning*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	34.851	21.991	6.765	6.398	-	6.398	-	-	-	-	-	-
776: *Advance Distributed Learning (ADL)*	34.851	21.991	6.765	6.398	-	6.398	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Advanced Distributed Learning (ADL) program is helping DoD evolve its distributed learning systems (e.g., online courses, smartphone-based learning, and DoD-wide enterprise systems for training and education). These improvements benefit DoD in several ways: (1) EFFICIENCY: Increase business systems' efficiency, saving time and resources, by eliminating duplications and developing shared services for digital learning technology and data. (2) EFFECTIVENESS: Improve the quality and efficiency of training/education delivery via online systems by developing modern technologies, integrated data systems, and associated learning science, ultimately impacting personnel readiness.

This program was originally established in response to Section 378 of Public Law 105-261, the FY99 NDAA. Other authorities were later provided through, for example, Defense Planning Guidance. The ADL program directly supports all DoD Components, and as a leader in the field of distributed learning technologies, also coordinates with other Federal agencies, Allies, and Partners. This leads to the program's third benefit: (3) INTEROPERABILITY: It strengthens interagency, interorganizational, and multinational interoperability by developing shared distributed learning capabilities and policy and through leadership in DoD, Federal, and Coalition communities of practice.

The program's work falls into three interrelated categories: (A) Modernization, (B) Documentation, and (C) Coordination. The "modernization" work involves Advanced Technology Development (RDT&E subfield Advanced Technology Development 6.3) in technical areas such as e-learning, mobile learning, IT/data interoperability, learner data modeling and analytics, and associated learning science. These efforts inform the program's "documentation" work, including the authoring and upkeep of technical guidance and policy documents, such as DoD Instruction 1322.26 ("Distributed Learning") and software/data interoperability specifications. Finally, the documentation work drives "coordination" efforts, which consist of implementation support and interagency, interorganizational, and international (e.g., NATO) coordination.

This program's modernization investments are vetted through the Defense ADL Advisory Committee, a working group of military personnel and DoD/Federal civilians who formally represent their organizations' distributed learning interests. These requirements are also aligned to DoD/Federal strategic direction, such as the DoD Digital Modernization Strategy, DoD and Federal Data Strategies, and Personnel and Readiness Strategy for 2030. They are also considered against emerging industry trends and technologies.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603769D8Z / *Advanced Distributed Learning*

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	22.446	6.765	6.478	-	6.478
Current President's Budget	21.991	6.765	6.398	-	6.398
Total Adjustments	-0.455	0.000	-0.080	-	-0.080
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Program Adjustment	-0.455	-	-0.080	-	-0.080

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Advance Distributed Learning (ADL)	21.991	6.765	6.398

Description: Advance Distributed Learning (ADL) program serves as the innovation hub for distributed learning across DoD and other government agencies. The ADL program supports DoD-wide initiatives for innovation, modernization, and advancement of online and mobile electronic training capabilities as well as associated enterprise-wide software/data services. Activities include advanced technology design and development, demonstrations, assessments, and associated policy stewardship. Results improve efficiencies and reduce costs, in part, by reducing time spent in face-to-face instruction, allowing more time for practical application and repetition, increasing interoperability (which enables discovery, retrieval, and reuse of distributed learning content), and researching and prototyping methods of distributed learning with superior motivational and learning outcomes.

FY 2021 Plans:

1. Enterprise Course Catalog -- Fuse existing capabilities and new technologies to consolidate course listings to a Defense-wide training and education course catalog, accessible through a single web-based portal. Facilitate transition to full operational capability in collaboration with the Office of Personnel Management (OPM) USALearning program and other Defense stakeholders. This work directly supports DoD Reform Management Group–directed reform.

2. Enterprise Learner Record -- Continue work from FY20 to inform and establish operational capabilities and policies for the interoperability of Defense-wide learning and development records. Demonstrate initial operational capability. This work directly supports DoD Reform Management Group–directed reform and aligns with other DoD, Federal, and industry interoperable learner record efforts.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603769D8Z / *Advanced Distributed Learning*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
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 supports digital learning modernization reforms by providing the foundational data interoperability fabric for digital learning software systems. Progress on this line of effort is coordinated with stakeholders from the DoD Chief Data Officer (CDO) Council Architecture working group, among other DoD and industry partners. 4. Update Distributed Learning Policy and Guidance -- Continue to lead the Defense ADL Advisory Committee (i.e., the functional community for DoD distributed learning personnel). Incorporate new requirements into existing Defense policy (e.g., DoDI 1322.26, NATO Standardization Agreement 2591), as required, in areas such as acquisition guidance for digital learning, data standards, and digital identity assurance (e.g., Federal Identity, Credential, and Access Management). 5. Coordination -- Continue to coordinate with Defense Allies and Partners on distributed learning, to include the NATO Training Group, Partnership for Peace Consortium, and The Technical Cooperation Program. Work with DoD groups (e.g., Defense ADL Advisory Committee, CDO Council, Joint Enterprise Standards Committee) and professional technical organizations to enact and govern software/data standards and digital learning science.			
FY 2022 Plans: 1. Enterprise Course Catalog -- Finalize transition of the Enterprise Course Catalog by completing remaining test and evaluation efforts in coordination with OPM USALearning. Complete any remaining steps to obtain cybersecurity accreditation for operation of the system. Finalize the associated standard for Learning Metadata, and coordinate with the CDO Council to potentially expand relevant shared services from this effort into other DoD systems (e.g., for linked data). 2. Enterprise Learner Record Repository -- Finalize the Learner Profile standard. Conduct developmental testing of the initial operational capability, demonstrating safe data integration of learner records across multiple DoD organizations. Coordinate with OPM USALearning. 3. Learning Services Ecosystem -- This work will focus on documenting the Total Learning Architecture (TLA) Enterprise Architecture, i.e., the software/data backbone across digital training and education technologies. Coordinated work on the developmental environment will continue with Defense Components to support implementation of the TLA with their systems (i.e., modernizing legacy technology). DevSecOps documentation will be produced to help these organizations transition the TLA. 4. Update Distributed Learning Policy -- Continue to coordinate with the Defense ADL Advisory Committee to incorporate new requirements into existing Defense policy, as required. Additional work is anticipated to integrate updated guidance on data standards and the enterprise architecture. New guidance on Federal Identity, Credential, and Access Management as well as			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603769D8Z *I Advanced Distributed Learning*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
data privacy, data handling, and single sign-on will also be considered in support of the Enterprise Course Catalog and Enterprise Learner Record Repository. 5. Coordination -- Continue to coordinate with Defense Allies and Partners on distributed learning, to include the NATO Training Group, Partnership for Peace Consortium, and The Technical Cooperation Program. Work with DoD groups (e.g., Defense ADL Advisory Committee, CDO Council, Joint Enterprise Standards Committee) and professional technical organizations to enact and govern software/data standards and digital learning science. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Program change due to minor budgetary fluctuations.			
Accomplishments/Planned Programs Subtotals	21.991	6.765	6.398

D. Other Program Funding Summary ($ in Millions)

N/A

Remarks

E. Acquisition Strategy

N/A

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603781D8Z / *Software Engineering Institute (SEI)*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	-	14.556	12.590	14.677	-	14.677	-	-	-	-	-	-
781: *Software Engineering Institute (SEI)*	-	13.559	12.590	14.677	-	14.677	-	-	-	-	-	-
816: *Cyber Security*	-	0.997	0.000	0.000	-	0.000	-	-	-	-	-	-

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 Department of Defense (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 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603781D8Z / *Software Engineering Institute (SEI)*

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	15.111	12.598	12.825	-	12.825
Current President's Budget	14.556	12.590	14.677	-	14.677
Total Adjustments	-0.555	-0.008	1.852	-	1.852
• Congressional General Reductions	-	-0.008			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.552	-			
• Program Adjustment	-	-	1.852	-	1.852
• Cancelled Amount	-0.003	-	-	-	-

Change Summary Explanation

Increase in FY 2022 supports Artificial Intelligence Engineering Initiatives.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603781D8Z / *Software Engineering Institute (SEI)*	Project (Number/Name) 781 / *Software Engineering Institute (SEI)*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
781: *Software Engineering Institute (SEI)*	-	13.559	12.590	14.677	-	14.677	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

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 2020	FY 2021	FY 2022
Title: Software Engineering Institute Advanced Technology Development in the Area of Software Engineering, Systems Verification and Validation, and Mission Assurance	9.604	10.818	10.890
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 2021 Plans: • 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. • 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 2022 Plans: • Incorporate uncertainty modeling and methods to improve machine-learning models used by DoD/IC organizations to increase their ability to reason about machine learning model inferences and to reduce the time to retrain to achieve and acceptable level of accuracy and/or certainty.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603781D8Z / *Software Engineering Institute (SEI)*	**Project (Number/Name)** 781 / *Software Engineering Institute (SEI)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
• Verify and extend model checking for design properties of for DoD systems and software, demonstrating a reduction in the mean time required to detect design defects from months to hours. • Prototype an AI risk analysis approach that enables developers to elicit requirements and conduct an independent verification of the security properties of the machine learning components through unit, integration, and uncertainty tests. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Changes reflect minor budget fluctuations.			
Title: Software Engineering Institute Advanced Technology Development in the Area of Information Assurance ***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. ***FY 2021 Plans:*** • Create an AI risk analysis framework 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. ***FY 2022 Plans:*** • Implement new capabilities in model software and system engineering to a) map models to micro-service performance b) use of an external micro-service analysis tool to simulate the propagation of faults and the system reconfiguration. • Utilize AI test harness to verify security properties of neural network components through unit, integration, and uncertainty tests. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Changes reflect minor budget fluctuations.	3.955	1.772	1.787
Title: Artificial Intelligence Engineering Initiatives ***Description:*** Artificial Intelligence (AI) engineering is an emergent discipline focused on developing tools, systems, and processes to enable the application of artificial intelligence in real-world contexts. The rise in availability of computing power and massive datasets have led to the creation of new AI, models, and algorithms encompassing thousands of variables and capable of making rapid and impactful decisions. Too often, though, these capabilities work only in controlled environments and are difficult to replicate, verify, and validate in the real world. The need for an engineering discipline to guide the development and deployment of AI capabilities is urgent. AI engineering aims to provide a framework and tools to proactively design AI systems to function in environments characterized by high degrees of complexity, ambiguity, and dynamism; and aims to equip practitioners to develop systems across the enterprise-to-edge spectrum, to anticipate requirements in changing operational environments and conditions, and to ensure human needs are translated into understandable, ethical, and thus trustworthy AI.	-	-	2.000

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603781D8Z / *Software Engineering Institute (SEI)*	**Project (Number/Name)** 781 / *Software Engineering Institute (SEI)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
FY 2022 Plans: This project area will develop an AI Engineering Book of Knowledge, creating a Department standard specifying a guide to the generally accepted AI engineering approach. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Increase in funding for Artificial Intelligence Engineering Initiatives.			
Accomplishments/Planned Programs Subtotals	13.559	12.590	14.677

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
• BA 2, RDT&E, PE # 0602751D8Z: *Software Engineering Institute Applied Research*	9.232	9.567	9.601	-	9.601	-	-	-	-	-	-

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603781D8Z / *Software Engineering Institute (SEI)*	Project (Number/Name) 816 / *Cyber Security*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
816: *Cyber Security*	-	0.997	0.000	0.000	-	0.000	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

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 2020	FY 2021	FY 2022
Title: Cyber Security ***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.	0.997	-	-
Accomplishments/Planned Programs Subtotals	0.997	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603826D8Z / *Quick Reaction Special Projects (QRSP)*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	363.207	34.457	0.000	0.000	-	0.000	-	-	-	-	-	-
828: *Rapid Reaction Fund*	347.879	32.106	0.000	0.000	-	0.000	-	-	-	-	-	-
833: *Strategic Multi-Layered Assessment (SMA) Support*	15.328	2.351	0.000	0.000	-	0.000	-	-	-	-	-	-

Note

In FY 2021, all funding and project investment areas in the Quick Reaction Special Projects (QRSP) Program Element (PE) transitioned to PE 0603338D8Z Defense Modernization and Prototyping.

A Congressional rescission of $9.000 million was enacted as part of the FY 2021 Appropriation reducing the available FY 2020 budget to $25.457 million.

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).

The QRSP Program supports two major project codes that expedite development and transition of new capabilities to the warfighter. These project codes are: 1) Rapid Reaction Fund (RRF), and 2) 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.

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.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603826D8Z *I Quick Reaction Special Projects (QRSP)*

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	35.647	0.000	0.000	-	0.000
Current President's Budget	34.457	0.000	0.000	-	0.000
Total Adjustments	-1.190	0.000	0.000	-	0.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-1.184	-			
• Program Adjustments	-0.006	-	-	-	-

Change Summary Explanation

A Congressional rescission of $9.000 million was enacted as part of the FY 2021 Appropriation reducing the available FY 2020 budget to $25.457 million.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603826D8Z / *Quick Reaction Special Projects (QRSP)*	Project (Number/Name) 828 / *Rapid Reaction Fund*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
828: *Rapid Reaction Fund*	347.879	32.106	0.000	0.000	-	0.000	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In FY 2021, the Rapid Reaction Fund (RRF) transitioned to PE 0603338D8Z Defense Modernization and Prototyping.

$9.000 million of the Congressional rescission was applied to Project Code 828 Rapid Reaction Fund reducing the available FY 2020 budget to $23.106 million.

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 (FFRDCs), 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 continued to support the USD(R&E) and provided 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:
• The Towed Airborne Lift of Naval Systems (TALONS) Greenough Advanced Rescue Craft (GARC) provides an autonomous, towed system that can fly large payloads at significant altitudes. TALONS/GARC can loft intelligence, surveillance, and reconnaissance (ISR) payloads to increase the situational awareness of unmanned systems; and, can loft communications payloads to extend coverage beyond line of sight (LOS). The project successfully transitioned to the United States Special Operations Command (USSOCOM) and the United States Marine Corps (USMC).
• Storm delivered a highly innovative warhead design that reduces collateral damage and simultaneously increases lethality against small, light targets by focusing the fragmentation pattern. The program successfully transitioned to USSOCOM and the USMC.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603826D8Z / *Quick Reaction Special Projects (QRSP)*	**Project (Number/Name)** 828 / *Rapid Reaction Fund*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: FY 2020 Congressional Rescission ***Description:*** Congressional rescission applied to Project Code 828 Rapid Reaction Fund.	9.000	-	-
Title: Low Cost Innovative Projects (Projects less than one million dollars each) ***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 2020, RRF selected, executed, and transitioned multiple low cost projects, including: • Millimeter-Wave Signal Processor (MMWSP): This project developed a microwave subsystem comprising a high-performance integrated circuit (IC) and associated control electronics to enhance traditional radio frequency (RF) front ends. This project successfully transitioned to the U.S. Navy. • High Performance Solid Rocket Propellant: This project developed a novel, aluminum-lithium alloy to be evaluated as a fuel in solid rocket propellant. This new ingredient could increase munition performance, and removes a dangerous emission common in alternative formulations. This project was transitioned to the U.S. Army. • SATURN Waveform: An enhanced waveform for use in SATURN transceivers. This technology supports effective Fully Networked Command, Control, and Communications (FNC3) channels in heavily-contested environments. This project was transitioned to the U.S. Air Force. • Magnetic Navigation: This project developed and tested an innovative navigation capability for GPS-denied environments. This capability successfully transitioned to the U.S. Air Force and U.S. Navy. • Smart Sensor: An autonomous sensor platform that significantly accelerates object identification, target recognition, and placement of effects on target. This capability transitioned to the U.S. Air Force. • Canine Head Mounted Display: A prototype head-mounted display (HMD) for military working dogs that allows the canine handler to maintain greater stand-off from hazardous situations. This project successfully transitioned to USSOCOM for further development. • Advanced Security Tag: A novel capability to mark, scan, and catalog military components that will be used to track and control inventories while eliminating or mitigating the risks associated with parts tracking, quality control, and security management within maintenance and operational chains. This project successfully transitioned to the U.S. Navy. • Vector Sensor: A novel line of bearing system for radio frequency signals from an airborne platform. The sensor enables enhanced geolocation from operational standoffs and altitudes. This prototype transitioned to the U.S. Army. • Lightweight Transparent Armor: Developed a cost-effective, lightweight, ballistic armor to counter and protect against small arms calibers. This program successfully transitioned to the U.S. Army. • Weapon System Virtual Reality (VR): Developed a virtual reality training program for pilots that uses machine learning to analyze performance, identify trends, and adjust curriculum to optimize performance. The system is focused on building pilot proficiency when simulators or instructors are not available. This program successfully transitioned to the U.S. Air Force.	13.887	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603826D8Z / *Quick Reaction Special Projects (QRSP)*	**Project (Number/Name)** 828 / *Rapid Reaction Fund*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
• High Performance Propulsion System for Picosatellites: A novel, low-cost nanoscale electrospray propulsion system that provides high thrust density of small satellites. The prototype technology transitioned to multiple U.S. Government agencies. • Smart Probe: Developed tools and software for executing a novel approach to protocol modeling and analysis that will revolutionize how the DoD recognizes vulnerabilities and takes corrective countermeasures. This project successfully transitioned to the U.S. Navy. • Swift QUiet Airfield Assessment Device (SQUAAD): SQUAAD developed a novel prototype to assess the suitability of airfields for aircraft operations. The project transitioned to the U.S. Air Force. • BANSHEE: A solution for analyzing document data streams using a suite of machine learning algorithms and interactive visualizations to provide fast and optimized document triage and understanding for the novice user. This project successfully transitioned to DoD end users. • Red Claw: Developed and demonstrated the capability to detect, classify, locate, and track signals of interest. The capability transitioned to the U.S. Navy, U.S. Army, and USSOCOM. • Single Tag: Developed and demonstrated a data-triage tool that uses data-processing algorithms to rapidly clean, sort, and label data. This technology is currently in use by DoD analysts. • Enhanced Low Resource Language Identification: Developed novel tools and algorithms to identify low-resource/low-density languages in austere environments. This technology successfully transitioned to DoD agencies in support of the United States Africa Command (USAFRICOM). • Jaded Unicorn: Developed and demonstrated an innovative electronic-warfare capability, easily deployable on existing platforms, to address modern challenges. The capability successfully transitioned to the U.S. Army, U.S. Navy, and U.S. Air Force. • Mid-wave infrared (MWIR) fiber laser: A novel fiber laser design demonstrating a 10x increase in optical power compared to the current state of art. Prototype successfully transitioned to the U.S. Navy for further development.			
Title: Advanced Tactical SIGINT System (ATSS) ***Description:*** The ATSS project prototyped scalable, extremely high performance electronic warfare/signals intelligence (EW/SIGINT) capability modules with a small footprint. ATSS enhances Electronic Warfare Officers' (EWOs) capabilities to identify and classify signals in dense electromagnetic environments. Three Tactical SIGINT kits were prototyped and transitioned to the U.S. Army for operational evaluation.	1.387	-	-
Title: Tactical Grade-Inertial Measurement Unit (TG-IMU) ***Description:*** The TG-IMU project developed and demonstrated a millimeter-scale, tactical grade IMU providing a 1,000x reduction in volume and 10,000x reduction in power compared to existing IMUs. TG-IMU enables improved navigation in GPS-contested environments for small caliber munitions such as the Army Precision Guidance Kit–Anti-Jam (PGK-AJ), XM1155, and	1.156	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603826D8Z / *Quick Reaction Special Projects (QRSP)*	**Project (Number/Name)** 828 / *Rapid Reaction Fund*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Excalibur HTK, along with the Navy Moving Target Artillery Round (MTAR). TG-IMU transitioned to the U.S. Army and U.S. Navy for further development.			
Title: Silver Dart ***Description:*** The Silver Dart project rapidly developed and demonstrated a low-cost, air-launched, supersonic munition prototype. In FY 2020, the Silver Dart prototype design was refined and completed a series of flight tests to validate prototype performance against predicted results. Work continues in FY 2021 to refine the prototype prior to a final ground launch flight test series to demonstrate prototype performance at speeds and altitudes analogous to air launch conditions. The Silver Dart prototype transitioned to the U.S. Air Force for further development.	1.000	-	-
Title: Strategic Multi-Layered Assessment (SMA) Reach Back Cell ***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. These 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 multiagency, 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.	2.301	-	-
Title: Automated Mitigation of Disinformation Amplifiers (AMDA) ***Description:*** The AMDA project is developing and demonstrating safe and reliable autonomous software agents that can effectively counter malicious botnet implants and similar large-scale malware. In FY 2020, AMDA completed research and development to investigate the performance, effectiveness, and scale of botnets. Work continues in FY 2021 using FY 2020 funds to complete development and execute a final demonstration of the AMDA capability. The AMDA prototype will transition to the U.S. Air Force.	1.425	-	-
Title: Quicksilver ***Description:*** Quicksilver prototyped and matured an adaptable solution for Counter Radio Controlled Improvised Explosive Device (RCIED) Electronic Warfare (CREW) systems. The developed solution will reduce U.S. combat fatalities and protect	1.950	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603826D8Z / *Quick Reaction Special Projects (QRSP)*	**Project (Number/Name)** 828 / *Rapid Reaction Fund*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
equipment and facilities from improvised explosive devices, augmenting CREW system performance and effectiveness. Quicksilver transitioned to the U.S. Navy.			
Accomplishments/Planned Programs Subtotals	32.106	-	-

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 2022 Office of the Secretary Of Defense											Date: May 2021	
Appropriation/Budget Activity 0400 / 3					R-1 Program Element (Number/Name) PE 0603826D8Z / *Quick Reaction Special Projects (QRSP)*				Project (Number/Name) 833 / *Strategic Multi-Layered Assessment (SMA) Support*			
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
833: *Strategic Multi-Layered Assessment (SMA) Support*	15.328	2.351	0.000	0.000	-	0.000	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In FY 2021, the Strategic Multi-Layered Assessment (SMA) Support transitioned to PE 0603338D8Z Defense Modernization and Prototyping.

A. Mission Description and Budget Item Justification

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 2020	FY 2021	FY 2022
Title: Strategic Multi-Layered Assessment (SMA)	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. The United States 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.			
Accomplishments/Planned Programs Subtotals	2.351	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603826D8Z / *Quick Reaction Special Projects (QRSP)*	**Project (Number/Name)** 833 / *Strategic Multi-Layered Assessment (SMA) Support*

C. Other Program Funding Summary ($ in Millions)

Remarks

D. Acquisition Strategy

N/A

THIS PAGE INTENTIONALLY LEFT BLANK

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603833D8Z / *Engineering Science and Technology (S&T)*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	83.444	18.900	0.000	0.000	-	0.000	-	-	-	-	-	-
401: *DoD Modeling and Simulation Management Office*	23.173	4.701	0.000	0.000	-	0.000	-	-	-	-	-	-
402: *Systems Engineering Research Center*	18.216	4.782	0.000	0.000	-	0.000	-	-	-	-	-	-
403: *Engineered Resilient Systems*	42.055	9.417	0.000	0.000	-	0.000	-	-	-	-	-	-

Note

In FY 2021, funding realigned to 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 one and three 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 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.

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, in FY 2021, ERS project funding transitions to Systems Engineering (Program Element 0605142D8Z). With further ERS advances from a development project to an enduring support capability, this shift better aligns 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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	19.376	0.000	0.000	-	0.000
Current President's Budget	18.900	0.000	0.000	-	0.000
Total Adjustments	-0.476	0.000	0.000	-	0.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.473	-			
• Program Adjustments	-0.003	-	-	-	-

Change Summary Explanation

In FY 2021, funding realigned to 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.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603833D8Z / *Engineering Science and Technology (S&T)*	Project (Number/Name) 401 / *DoD Modeling and Simulation Management Office*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
401: *DoD Modeling and Simulation Management Office*	23.173	4.701	0.000	0.000	-	0.000	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

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 2020	FY 2021	FY 2022
Title: DoD Modeling and Simulation Management Office (MSMO)	4.701	-	-
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 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603833D8Z / *Engineering Science and Technology (S&T)*	**Project (Number/Name)** 401 / *DoD Modeling and Simulation Management Office*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
FY 2020 funds 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. In FY 2021, MSMO transitions to Systems Engineering (Program Element 0605142D8Z).			
Accomplishments/Planned Programs Subtotals	4.701	-	-

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 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603833D8Z / *Engineering Science and Technology (S&T)*	Project (Number/Name) 402 / *Systems Engineering Research Center*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
402: *Systems Engineering Research Center*	18.216	4.782	0.000	0.000	-	0.000	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

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 2020	FY 2021	FY 2022
Title: Systems Engineering Research Center	4.782	-	-
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. In FY 2021, SERC transitions to Systems Engineering (Program Element 0605142D8Z).			
Accomplishments/Planned Programs Subtotals	4.782	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603833D8Z / *Engineering Science and Technology (S&T)*	Project (Number/Name) 403 / *Engineered Resilient Systems*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
403: *Engineered Resilient Systems*	42.055	9.417	0.000	0.000	-	0.000	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In FY 2021, Engineered Resilient Systems (ERS) funding and mission realigns to Systems Engineering (Program Element 0605142D8Z) 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. In FY 2021, ERS project funding transitions 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 2020	FY 2021	FY 2022
Title: Engineered Resilient Systems (ERS)	9.417	-	-
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. In FY 2021, ERS transitions to Systems Engineering (Program Element 0605142D8Z).			
Accomplishments/Planned Programs Subtotals	9.417	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603833D8Z / *Engineering Science and Technology (S&T)*	**Project (Number/Name)** 403 / *Engineered Resilient Systems*

C. Other Program Funding Summary ($ in Millions)

Remarks

N/A

D. Acquisition Strategy

N/A

THIS PAGE INTENTIONALLY LEFT BLANK

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603924D8Z / *High Energy Laser Advanced Development*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	-	78.057	112.842	107.397	-	107.397	-	-	-	-	-	-
924: *High Energy Laser Initiative*	-	78.057	112.842	107.397	-	107.397	-	-	-	-	-	-

Note

Beginning in FY 2022 this Program will focus on Advanced Technology Development for Directed Energy (DE) technologies divided into the following areas: (1) DE Sources; (2) Beam Control & Propagation; (3) Lethality & Vulnerability; and (4) Power & Thermal Management to reflect the Department of Defense Science and Technology (S&T) strategy and Office of the Secretary of Defense (OSD) Science and Technology (S&T) priorities for DE.

A. Mission Description and Budget Item Justification

This program element funds Directed Energy (DE) 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. DE 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, DE systems 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 DE system missions across the Department of Defense (DoD).

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	80.723	105.410	108.663	-	108.663
Current President's Budget	78.057	112.842	107.397	-	107.397
Total Adjustments	-2.666	7.432	-1.266	-	-1.266
• Congressional General Reductions	-	-0.068			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	7.500			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-2.652	-			
• Program Adjustment	-	-	-1.266	-	-1.266
• Cancelled Account	-0.014	-	-	-	-

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2020	FY 2021
Project: 924: *High Energy Laser Initiative*		
Congressional Add: *Power and Thermal Systems*	-	7.432

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603924D8Z *I High Energy Laser Advanced Development*

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2020	FY 2021
Congressional Add Subtotals for Project: 924	-	7.432
Congressional Add Totals for all Projects	-	7.432

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603924D8Z / *High Energy Laser Advanced Development*	Project (Number/Name) 924 / *High Energy Laser Initiative*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
924: *High Energy Laser Initiative*	-	78.057	112.842	107.397	-	107.397	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Beginning in FY 2022 this Program will focus on Directed Energy (DE) technologies divided into the following areas: (1) DE Sources; (2) Beam Control & Propagation; (3) Lethality & Vulnerability; and (4) Power & Thermal Management to reflect the Department of Defense Science and Technology (S&T) strategy and Office of the Secretary of Defense (OSD) Science and Technology (S&T) priorities for DE.

A. Mission Description and Budget Item Justification

This program element is part of an overall Department strategy in Directed Energy (DE) weapon system advanced technology development. This effort will focus on scaling the output power of DE systems to reach operationally effective power levels applicable to broad mission areas across the DoD. Additionally, efforts will also pursue improvements in common DE system components such as beam control & propagation, lethality & vulnerability, and efficient power and thermal management approaches. This program element complements, and will be closely coordinated with other DoD DE efforts directed at specific Service and Agency missions.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Directed Energy Advanced Development	78.057	105.410	107.397
Description: This effort is focused on increasing the capabilities of Directed Energy (DE) 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 DE by the Services and Agencies.			
FY 2021 Plans: - Laser Scaling: Designs for 300 kW class high energy laser (HEL) systems will be finalized and the system elements will be integrated into prototype 300 kW systems. Architectures and systems 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. - High Energy Laser lethality: Collect additional data on laser and high power microwave damage effects (including cyber and electronic warfare applications) and experimentation results from the services, including modeling and simulation results. Data continues to be integrated into the unified database, which was developed in FY 2020. Investigating power & thermal management technologies for 300-500 kW laser systems under the High Energy Laser scaling effort.			
FY 2022 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603924D8Z / *High Energy Laser Advanced Development*	**Project (Number/Name)** 924 / *High Energy Laser Initiative*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
- Directed Energy Sources: Ongoing 300 kW-class high energy laser (HEL) sources will be completed and tested. The HEL sources will be transitioned and integrated into Service HEL system testbeds and demonstrators. The additional 300 kW-class HEL source, started in FY21, will be matured and initial elements will be integrated into the laser system. Planning for 500 kW-class laser source development will begin as open architectures and components are matured to support scaling from 300 to 500 kW. - Beam Control & Propagation: Continue to collect data on thermal blooming effects of high-power lasers, including the effects of aerosols. Continue to model beam propagation for Service HEL tactical engagements. Collect data on thermal blooming effects at higher laser powers to validate HEL propagation models. Advance technologies for atmospheric compensation and thermal blooming mitigation. Evaluate beam control efforts across the Department and develop an investment strategy for cross-cutting technology development in beam control systems. - Lethality & Vulnerability: Collect lethality damage effects on common threats across the services for high energy lasers and high power microwaves. These results, along with additional data from the services, include modeling and simulation analysis that will be used by the services to generate key vulnerability modules (VMs) for use in DE weapons effectiveness, mission and campaign level utility studies. The establishment of a unified lethality database that began in FY2020 and will be completed in early FY2022. As new lethality and vulnerability data are collected by the Services, the information will be integrated into the unified lethality database. Investigate the military utility of pulsed lasers. - Power & Thermal: Complete efforts begun in FY 2021 and evaluate technologies for further advanced development investments. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Increase is due to minor budget fluctuations.			
Accomplishments/Planned Programs Subtotals	78.057	105.410	107.397

	FY 2020	FY 2021
Congressional Add: Power and Thermal Systems	-	7.432
FY 2021 Plans: Investigating power & thermal management technologies for 300-500 kW laser systems under the High Energy Laser scaling effort.		
Congressional Adds Subtotals	-	7.432

C. Other Program Funding Summary ($ in Millions)

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603924D8Z / *High Energy Laser Advanced Development*	**Project (Number/Name)** 924 / *High Energy Laser Initiative*

C. Other Program Funding Summary ($ in Millions)

Remarks

D. Acquisition Strategy

N/A

THIS PAGE INTENTIONALLY LEFT BLANK

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603941D8Z / *Test and Evaluation/Science and Technology*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	743.493	186.017	178.438	267.161	-	267.161	-	-	-	-	-	-
091: *High Speed Systems Test*	227.666	89.462	101.808	108.774	-	108.774	-	-	-	-	-	-
092: *Spectrum Efficient Technology*	66.576	11.720	9.725	9.376	-	9.376	-	-	-	-	-	-
093: *Electronic Warfare Test*	97.842	16.750	9.980	90.171	-	90.171	-	-	-	-	-	-
094: *Advanced Instrumentation Systems Technology*	70.487	16.814	11.034	11.209	-	11.209	-	-	-	-	-	-
095: *Directed Energy Test*	67.936	15.001	10.096	10.568	-	10.568	-	-	-	-	-	-
096: *C4I & Software Intensive Systems Test*	119.618	10.128	11.977	12.128	-	12.128	-	-	-	-	-	-
097: *Autonomy and Artificial Intelligence Test*	55.008	11.141	10.648	11.087	-	11.087	-	-	-	-	-	-
098: *Cyberspace Test*	38.360	15.001	13.170	13.348	-	13.348	-	-	-	-	-	-
099: *Space Test*	0.000	0.000	0.000	0.500	-	0.500	-	-	-	-	-	-

Note

Starting in FY 2020, Project 097 title changed 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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	191.574	187.065	139.577	-	139.577
Current President's Budget	186.017	178.438	267.161	-	267.161
Total Adjustments	-5.557	-8.627	127.584	-	127.584
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-8.500			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-5.557	-			
• SBIR/STTR Transfer	-	-			
• DoD add for Long Range Fires Testing and Evaluation	-	-	56.300	-	56.300
• DoD add for Joint Electronic Warfareminance Modernization	-	-	74.500	-	74.500
• Program Adjustment	-	-0.127	-3.216	-	-3.216

Change Summary Explanation

The FY 2022 increase of $127.584 million is for testing in support of the Long Range Fires Testing and Evaluation and Joint Electronic Warfare Modernization.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603941D8Z / *Test and Evaluation/Science and Technology*	Project (Number/Name) 091 / *High Speed Systems Test*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
091: *High Speed Systems Test*	227.666	89.462	101.808	108.774	-	108.774	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

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 2020	FY 2021	FY 2022
Title: High Speed Systems Test	89.462	101.808	108.774
Description: The HSST project continued to advance ground and flight test technologies, techniques, instrumentation, and modeling and simulation capabilities required for the development of hypersonic weapon systems. In FY20, HSST focused primarily on two critical technology shortfalls for hypersonic test and evaluation: aerothermal and propulsion ground testing capabilities and advanced instrumentation to support hypersonic flight tests. Several other technology development efforts also progressed through the year. To address the technology shortfall involving aerothermal and propulsion testing, HSST is developing a new test facility that utilizes clean-air heat addition (non-vitiated air) and a variable Mach number (VMN) capability to provide the representative high-temperature conditions for characterizing weapon systems, including air-breathing propulsion capabilities. The clean-air heat addition is especially important to the characterization of air-breathing propulsion systems, as previous HSST efforts demonstrated			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603941D8Z / *Test and Evaluation/Science and Technology*	**Project (Number/Name)** 091 / *High Speed Systems Test*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
that vitiated air provides different gas properties than clean air found in the atmosphere and thus is not representative of what the vehicle would experience in flight. This significantly affects the engine's performance and operability in the test environment and results in erroneous flight predictions. Additionally, characterization of advanced sensors for hypersonic systems also benefits from clean-air heat addition as it provides a more representative environment for the sensor to operate in. The variable Mach number capability provides a more representative trajectory simulation for the system under test, permitting more accurate predictions before conducting flight tests. The new test facility, called the Hypersonic Aerothermal and Propulsion Clean-Air Testbed (HAPCAT), was checked out for initial operation in FY20, including the integration of the critical subcomponents of the Regenerative Storage Heater (RSH) and the Air Delivery System (ADS). Initial checkouts were conducted at lower-hypersonic representative temperatures to demonstrate operation of the facility. Designs for advanced sensor tests were developed to support multiple sensor development efforts ongoing within hypersonic development programs. Additionally, a Preliminary Design Review was completed for the VMN capability. All of the efforts associated with HAPCAT also serve as pathfinders for the development of a larger-scale, more capable facility at AEDC. Upgrades and development efforts associated with arc heater testing were also completed in FY20. The arc heater flow quality aerothermal test technology development was completed, demonstrating novel designs for arc heater spin coil components that provide higher quality flow to test articles and increases the lifespan of electrodes required for arc heater operation. These will be used to support the Mid-Pressure Arc Heater capability being implemented at the AEDC arc heater facility. Additionally, HSST completed multiple efficiency upgrades to the AEDC arc heaters to increase capacity in response to significant test demand. Significant progress was achieved in the development of the SkyRange capability, an unmanned aerial vehicle-based range to support hypersonic flight tests and other missions for the Department of Defense. SkyRange will provide a more agile, flexible, and cost-effective method for providing support to hypersonic flight tests with increased data collection capabilities beyond the current state-of-the-art. It also addresses a critical capacity shortfall for supporting the number of hypersonic flight tests required, as a sufficient number of existing assets does not exist. RQ-4 Global Hawks and MQ-9 Reapers comprise the platforms used for SkyRange. SkyRange will augment existing air, sea, and land test support assets referred to as the "string of pearls," reducing the high costs associated with traditional flight test support. Novel sensors are being developed in the areas of telemetry capture and relay, multispectral imaging, atmospheric sensing, terminal scoring, and other areas to aid in the development of hypersonic systems. Several of these sensors are being developed through HSST for integration into the SkyRange capability. Description: The HSST project continued to advance ground and flight test technologies, techniques, instrumentation, and modeling and simulation capabilities required for the development of hypersonic weapon systems. In FY20, HSST focused			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603941D8Z / *Test and Evaluation/Science and Technology*	**Project (Number/Name)** 091 / *High Speed Systems Test*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
primarily on two critical technology shortfalls for hypersonic test and evaluation: aerothermal and propulsion ground testing capabilities and advanced instrumentation to support hypersonic flight tests. Several other technology development efforts also progressed through the year. To address the technology shortfall involving aerothermal and propulsion testing, HSST is developing a new test facility that utilizes clean-air heat addition (non-vitiated air) and a variable Mach number (VMN) capability to provide the representative high-temperature conditions for characterizing weapon systems, including air-breathing propulsion capabilities. The clean-air heat addition is especially important to the characterization of air-breathing propulsion systems, as previous HSST efforts demonstrated that vitiated air provides different gas properties than clean air found in the atmosphere and thus is not representative of what the vehicle would experience in flight. This significantly affects the engine's performance and operability in the test environment and results in erroneous flight predictions. Additionally, characterization of advanced sensors for hypersonic systems also benefits from clean-air heat addition as it provides a more representative environment for the sensor to operate in. The variable Mach number capability provides a more representative trajectory simulation for the system under test, permitting more accurate predictions before conducting flight tests. The new test facility, called the Hypersonic Aerothermal and Propulsion Clean-Air Testbed (HAPCAT), was checked out for initial operation in FY20, including the integration of the critical subcomponents of the Regenerative Storage Heater (RSH) and the Air Delivery System (ADS).. Initial checkouts were conducted at lower-hypersonic representative temperatures to demonstrate operation of the facility. Designs for advanced sensor tests were developed to support multiple sensor development efforts ongoing within hypersonic development programs. Additionally, a Preliminary Design Review was completed for the VMN capability. All of the efforts associated with HAPCAT also serve as pathfinders for the development of a larger-scale, more capable facility at AEDC. Upgrades and development efforts associated with arc heater testing were also completed in FY20. The arc heater flow quality aerothermal test technology development was completed, demonstrating novel designs for arc heater spin coil components that provide higher quality flow to test articles and increases the lifespan of electrodes required for arc heater operation. These will be used to support the Mid-Pressure Arc Heater capability being implemented at the AEDC arc heater facility. Additionally, HSST completed multiple efficiency upgrades to the AEDC arc heaters to increase capacity in response to significant test demand. Significant progress was achieved in the development of the SkyRange capability, an unmanned aerial vehicle-based range to support hypersonic flight tests and other missions for the Department of Defense. SkyRange will provide a more agile, flexible, and cost-effective method for providing support to hypersonic flight tests with increased data collection capabilities beyond the current state-of-the-art. It also addresses a critical capacity shortfall for supporting the number of hypersonic flight tests required, as a sufficient number of existing assets does not exist. RQ-4 Global Hawks and MQ-9 Reapers comprise the platforms used for			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603941D8Z / *Test and Evaluation/Science and Technology*	**Project (Number/Name)** 091 / *High Speed Systems Test*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
SkyRange. SkyRange will augment existing air, sea, and land test support assets referred to as the “string of pearls,” reducing the high costs associated with traditional flight test support. Novel sensors are being developed in the areas of telemetry capture and relay, multispectral imaging, atmospheric sensing, terminal scoring, and other areas to aid in the development of hypersonic systems. Several of these sensors are being developed through HSST for integration into the SkyRange capability. Achievements were made for both SkyRange aircraft platforms in FY20. Work continued on the modification of two RQ-4s to facilitate eventual sensor package integration as part of SkyRange. Upon completion, this will result in three operational RQ-4s for SkyRange. For the MQ-9s, six aircraft were acquired and stationed at the main operating base in California. These MQ-9s will be used for integrating various sensors, generally through the use of pylon-carried pods. The development, integration, and operation of a phased-array telemetry capability continued as part of SkyRange. Various checkouts of the telemetry system were performed while installed on an RQ-4 as part of the development of this capability to support hypersonic flight tests. Progress continued on the development of a high-fidelity automated and reconfigurable multispectral imaging tracking system for integration into an RQ-4 Global Hawk as part of the overall SkyRange capability. Design of the system was completed and fabrication and assembly progressed toward ground checkouts of the system. Development of an airborne variant of the High-Altitude LIDAR Atmospheric Sensing (HALAS) system continued, with a prototype version successfully installed on a Gulfstream G-IV business jet. Flight operations were conducted to acquire atmospheric data in an operational environment, and the data will be used to inform the design of the HALAS system for integration on an unmanned RQ-4 Global Hawk as part of the overall SkyRange capability. Development of a ground based multispectral thermal imaging prototype was completed to enable collection of thermal imagery in the terminal phase of a hypersonic flight test for thermal protection system evaluation. The system was deployed to the Kwajalein Atoll to support terminal phase data collection for a hypersonic flight test, and the prototype successfully acquired thermal imagery data that was subsequently provided to the weapon system program. Initial evaluation of the imagery indicated a successful deployment. Additional upgrades and technology development continued at the CUBRC hypersonic shock and expansion wind tunnels to support hypersonic ground testing. These included the design of fast-response force and moment balances for use in the CUBRC facilities, and multiple non-intrusive diagnostic systems for evaluation of hypersonic systems. In addition to these upgrades, a			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603941D8Z / *Test and Evaluation/Science and Technology*	**Project (Number/Name)** 091 / *High Speed Systems Test*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
new effort was initiated to develop and demonstrate a new test facility that utilizes wave rotor technologies for extended run-times with representative conditions at hypersonic speeds. ***FY 2021 Plans:*** In FY21, HSST will continue to focus on critical hypersonic test and evaluation shortfalls to address the Department's push to develop hypersonic systems. This includes executing efforts that will have near-term benefits to current weapon programs as well as addressing longer-term technology development requirements to support next-generation weapon systems. HSST will continue the development of the HAPCAT facility to support aerothermal, propulsion, and seeker/sensor performance testing. Checkout testing will be conducted at the upper envelope of the facility to demonstrate full operation of the facility and validate the enabling technologies that are a part of HAPCAT. Multiple test techniques, including combined effects testing of advanced sensors and direct-connect scramjet testing, will be developed and initially demonstrated. This includes support test entries for multiple programs to characterize the performance of advanced sensors. Rapid development of the overall SkyRange capability will also continue. The telemetry system will be integrated, flown, and operated on an RQ-4, providing support to hypersonic flight tests as an auxiliary asset. The multispectral imaging system will also be completed, integrated, and operated on an RQ-4. The multispectral imaging system will also be used to support hypersonic flight tests and other targets of opportunity to demonstrate performance. For the MQ-9s, initial operations will begin, to include trade studies on various sensor suites to achieve the various mission sets the MQ-9s will support as part of SkyRange. Range surveillance and clearance capabilities will be demonstrated and support multiple test ranges. New technology development efforts to address terminal scoring, weather measurement, and telemetry collection will be initiated. Overall, the concepts of operation of SkyRange will be further developed through these activities for an eventual initial operating capability. For ground test facilities, upgrades at the CUBRC facilities will continue. Progress on the new wave rotor facility will progress. New diagnostic capabilities will be developed for use in the CUBRC facilities as well as other relevant hypersonic ground test facilities to improve testing and evaluation of hypersonic systems. This includes the development of a multispectral imaging capability for facility health monitoring and system under test evaluations. Additionally, the design of a next generation ground test facility to support future hypersonic weapon systems will be developed to inform near-term investments required to realize such a facility. ***FY 2022 Plans:*** HAPCAT will achieve full operational capability, providing support to hypersonic weapon system programs test capabilities for aerothermal, propulsion, and combined effects advanced sensor characterization. Other test techniques to support directed energy and other propulsion system characterizations will also be developed.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603941D8Z / *Test and Evaluation/Science and Technology*	**Project (Number/Name)** 091 / *High Speed Systems Test*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
SkyRange will demonstrate full operation using multiple aircraft platforms, including RQ-4s and MQ-9s. Support will be provided to hypersonic flight tests using the telemetry, multispectral imaging, and atmospheric sensing sensor packages. This involves the completion of the atmospheric sensing capability. Additionally, development of terminal scoring capabilities deployed from SkyRange assets will continue. The new wave rotor heater at CUBRC will be completed and begin supporting hypersonic development programs . Further technology upgrades to arc heaters will continue to address capacity and capability shortfalls. Other test and evaluation gaps associated with ground and flight test, modeling and simulation, and instrumentation will be addressed through new efforts. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increase supports full operational capability of current programs.			
Accomplishments/Planned Programs Subtotals	89.462	101.808	108.774

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603941D8Z / *Test and Evaluation/Science and Technology*	Project (Number/Name) 092 / *Spectrum Efficient Technology*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
092: *Spectrum Efficient Technology*	66.576	11.720	9.725	9.376	-	9.376	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

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 2020	FY 2021	FY 2022
Title: Spectrum Efficient Technology	11.720	9.725	9.376
Description: 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			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603941D8Z / *Test and Evaluation/Science and Technology*	**Project (Number/Name)** 092 / *Spectrum Efficient Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
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. 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. ***FY 2021 Plans:*** 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 for a variety of unmanned aerial platforms. 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 wireless ground based test support networks in real-time using unobtrusive and bandwidth efficient methods. The SET project will initiate an effort to develop a ground based phased array antenna to support telemetry data requirements for large footprint test events such as DDG-1000. The SET project will initiate an effort to develop and mature phased array telemetry antenna technologies for manned aircraft to support Navy over the horizon telemetry requirements and reduce technical risk for a CTEIP effort to develop a next generation range support aircraft capability. The SET project will also continue to leverage cellular technologies to support aeronautical telemetry requirements. ***FY 2022 Plans:*** 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 for both manned and unmanned platforms. Ground based phased array telemetry antenna technologies to support large footprint test events will continue to be matured. The SET project will also continue to leverage cellular technologies to support aeronautical telemetry requirements. The SET project will initiate an effort to develop a ruggedized cellular based telemetry transceiver with size, weight, and power suitable for integration into a fighter aircraft. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** No significant program changes.			
Accomplishments/Planned Programs Subtotals	11.720	9.725	9.376

C. Other Program Funding Summary ($ in Millions)

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603941D8Z / *Test and Evaluation/Science and Technology*	**Project (Number/Name)** 092 / *Spectrum Efficient Technology*

C. Other Program Funding Summary ($ in Millions)

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603941D8Z / *Test and Evaluation/Science and Technology*	Project (Number/Name) 093 / *Electronic Warfare Test*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
093: *Electronic Warfare Test*	97.842	16.750	9.980	90.171	-	90.171	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

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 Electronic Warfare Electronic attack and Electronic protect community is developing jammers and EP measures that are more sophisticated and take advantage of newer technology that allows adaptive waveforms and artificial intelligence and autonomy to respond to threats more rapidly and robustly. In addition, the testing of these systems in realistic many on many environments that are more threat representative requires new technology investment.

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 2020	FY 2021	FY 2022
Title: Electronic Warfare Test	16.750	9.980	90.171
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			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603941D8Z / *Test and Evaluation/Science and Technology*	**Project (Number/Name)** 093 / *Electronic Warfare Test*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
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 2021 Plans:*** 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. EWT will continue to invest in IR Scene generation at higher frame rates. Design and develop a test capability to represent 5th generation electronic warfare threats in live test environments. The test capability will be used to test sensors and DoD systems against 5th generation electronic warfare threats, to include the testing and assessment of advanced electronic attack measures. Initiate a test campaign with the test capability to verify system performance and to demonstrate the system's 5th generation attributes. The EWT project will continue development of digital RF memory for threat representation. Work on high power solid state RF sources will continue. The EWT project will initiate an advance spectrum monitoring project that uses passive RF sensing over large bandwidths and high data rates. ***FY 2022 Plans:*** The EWT project will continue investments in Digital RF memory for adaptive waveforms. The EWT project will invest in technologies related to Cyber and EW convergence. EWT project will invest in technologies related to Cognitive EW, Cognitive Radar, and EW sensors that feed Artificial Intelligence uses of EW data. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increase to invest in 5th generation electronic warfare threat technology.			
Accomplishments/Planned Programs Subtotals	16.750	9.980	90.171

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603941D8Z / *Test and Evaluation/Science and Technology*	Project (Number/Name) 094 / *Advanced Instrumentation Systems Technology*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
094: *Advanced Instrumentation Systems Technology*	70.487	16.814	11.034	11.209	-	11.209	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

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 assessed at Department of Defense (DoD) installed systems test facility and hardware-in-the-loop testing (ISTF/HITL) and open-air range (including tropospheric, land-based, open-ocean, and undersea ranges) test facilities. Instrumentation requirements for systems under test are increasing exponentially for new weapons systems. System-borne, warfighter-wearable, and remote sensing 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 developing technologies for advanced TSPI instrumentation (especially with limited or no availability of Global Positioning System (GPS) signals), 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 needs for instrumentation can adversely affect weapon system signature and performance. Instrumentation for humans-in-the-loop, especially dismounted warfighters, must not adversely affect performance, induce artificiality in the test environment, nor create any operational burdens. New technologies can be exploited to integrate small, non-intrusive instrumentation (micro-technology) 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 2020	FY 2021	FY 2022
Title: Advanced Instrumentation Systems Technology	16.814	11.034	11.209
Description: Major thrusts included initiating and continuing efforts in advanced sensors, and TSPI instrumentation. The AIST project initiated an effort to support testing of military aircraft using externally mounted sound pressure instrumentation to gather data for analysis in all weather conditions, to overcome current constraints to flight testing in dry environments. The AIST project initiated a portable technology development effort using acoustic signatures to measure weapon location and attitude to characterize high dynamic weapon end-game maneuvers, and to evaluate impact location & velocity of attacking projectiles and resolving (scoring) very large quantities of impacts occurring closely spaced in position and/or time.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603941D8Z / *Test and Evaluation/Science and Technology*	**Project (Number/Name)** 094 / *Advanced Instrumentation Systems Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
To assist in assessing blunt trauma events, the AIST project completed development of technology to evaluate back face deformation of body armor, with final testing conducted at Aberdeen Test Center's Light Armor Range Complex. The AIST project will complete an effort in developing a high fidelity model which takes into account the noisier acoustic properties of shallow water environments 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). The AIST project will complete an effort related to electro-releasable attachment technology development. This included the investigation of new adhesive formulations that employ an electrically-releasing tape to allow for the attachment of sensors to non-conductive, painted surfaces of aircraft and other combat vehicles and significantly reduce the time to restore the system under test to its operational configuration. Efforts improved adhesion strength and ease of use. This effort culminated in field testing (e.g., onboard M1-Abrams Tanks and F-15 Fighter Jets) at Aberdeen Test Center and Edwards Air Force Base, respectively. ***FY 2021 Plans:*** The AIST project will continue efforts initiated FY 2020; and plans to initiate the development of a prototype technology suite to determine an object's placement and attitude relative to its target at the time of impact and fuse initiation above water for highly dynamic weapons at sea, requiring that weapon position and attitude (6 Degrees of Freedom (6-DOF)) be measured during terminal approach. Measurement parameters must be captured at a sampling rate adequate to fully characterize highly dynamic end-game maneuvers, while minimizing any impact to the weapon system itself in any way so as to preserve the integrity of testing. Ongoing efforts will include enabling the development of the next generation highly dynamic GPS receiver and its application to weapons testing. ***FY 2022 Plans:*** The AIST project will complete the technology development of a portable end-game scoring system and continue developing a broad ocean area test technology suite. The AIST project will continue development of: multi-disciplinary technologies addressing T&E requirements for real-time casualty assessment (RTCA) of warfighter and weapon 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. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** No significant program changes.			
Accomplishments/Planned Programs Subtotals	16.814	11.034	11.209

C. Other Program Funding Summary ($ in Millions)

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603941D8Z / *Test and Evaluation/Science and Technology*	**Project (Number/Name)** 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 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603941D8Z / *Test and Evaluation/Science and Technology*	Project (Number/Name) 095 / *Directed Energy Test*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
095: *Directed Energy Test*	67.936	15.001	10.096	10.568	-	10.568	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

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 and counter UAS 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 2020	FY 2021	FY 2022
Title: Directed Energy Test	15.001	10.096	10.568
Description: The DET project continued efforts to measure HEL energy on small targets such as mortars, rockets, artillery, and UAS. 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			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603941D8Z / *Test and Evaluation/Science and Technology*	**Project (Number/Name)** 095 / *Directed Energy Test*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Power Microwave beam in the far field. In 2020 DET demonstrated a neutron fluence that meets the entry criteria for the building of a larger reactor using DT fusion. DET developed HPM sensors that allow characterization of the beam profile of the HPM system. DET initiated HPM UAS targets for dynamic tests of HPM systems against threat relevant UAS targets. DET initiated an atmospheric modelling project that will correlate weather data to HEL propagation. ***FY 2021 Plans:*** 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. This will include sensor and associated data collection systems that can survive an HPM environment. DET will continue atmospheric modelling work that will allow the development of HEL predictive atmospheric propagation. DET will continue developing wide band HPM sources for assessing the performance of US systems in a hostile HPM environment. DET will continue the development of software and measurements to assess the survivability of DoD aircraft against HEL threats. ***FY 2022 Plans:*** 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 and expand into larger UAS classes. This will include sensor and associated data collection systems that can survive an HPM environment. DET will complete atmospheric modelling work that will allow the development of HEL predictive atmospheric propagation. DET will complete developing wide band HPM sources for assessing the performance of US systems in a hostile HPM environment. DET will continue the development of software and measurements to assess the survivability of DoD aircraft against HEL threats. DET will invest in aero-optics effects characterization tools. DET will invest in lower noise, broader band E-field measurement sensors for HPM characterization. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increase to support high priority counter UAS prototype developments as well as counter high speed cruise missile prototypes in support of MDA and USD R&E Programs.			
Accomplishments/Planned Programs Subtotals	15.001	10.096	10.568

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603941D8Z / *Test and Evaluation/Science and Technology*	**Project (Number/Name)** 095 / *Directed Energy Test*

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603941D8Z / *Test and Evaluation/Science and Technology*	Project (Number/Name) 096 / *C4I & Software Intensive Systems Test*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
096: *C4I & Software Intensive Systems Test*	119.618	10.128	11.977	12.128	-	12.128	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

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) and the National Defense Strategy. 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 technologies for next generation resilient, survivable, federated networks and information ecosystems (information superiority) from the tactical level up to strategic planning; as well as 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 2020	FY 2021	FY 2022
Title: C4I and Software Intensive Systems Test	10.128	11.977	12.128
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 multi-variant time series Sensor Data Anomaly Detection (SDAD) tool. The SDAD tool is based on a learning system that combines the analysts' knowledge with the classification knowledge obtained from big data techniques to achieve an automated post mission processing tool enabling identification of unknown anomalies within the terabytes of sensor data collected for a given flight test. The C4T project continues development of M&S technologies to support real-time assessments of torpedo performance in complex undersea environments, specifically for shallow water (<50 meters). These technologies provide an acoustic propagation model for both narrow and broad band, of sufficient fidelity to be used for the next generation of torpedo development as well as testing torpedo performance in various maritime tactical environments that cannot be assessed with live in-water testing. The			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603941D8Z / *Test and Evaluation/Science and Technology*	**Project (Number/Name)** 096 / *C4I & Software Intensive Systems Test*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
model includes a real-time simulation/emulation system for design and testing the next generation of torpedo sonar systems in multiple bathometry, biological and threat environments. 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 C4I and software intensive systems for joint mission effectiveness. The C4T project continued development of a network M&S to achieve configuration optimization of test support networks. Technologies included planning expeditionary tests, managing bandwidth and spectrum contention with a networked system under test, managing power consumption providing a 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 big data analytics (BDA) projects implementing artificial intelligence/ machine learning (AI/ML) techniques for multi-variant time series sensor datasets, unstructured dataset analytics (audio, video, and imagery), and advanced visualization of large T&E datasets. These technologies are being developed to support test and evaluation of future warfighter C4I and Software Intensive Systems (4th and 5th generation military platforms). ***FY 2021 Plans:*** The C4T project will develop test technologies to enable the next generation resilient, survivable, federated networks and information ecosystems (information superiority) from the tactical level up to strategic planning across three domains: BDA, Live and Simulated Environments, and Test Automation. Work targeted at BDA technologies will continue for analysis of large test databases for 4th and 5th generation military platforms (e.g. F-35) resulting in BDA tools tailored for use by ranges, with technologies to assist analysts with the reduction and complete analysis of large complex datasets. Increase the use of M&S for test planning to support emulation and stimulation of networks for conducting T&E as well as effectiveness testing of system performance (e.g. torpedoes). The C4T project 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 Operational Testing (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. Other areas of interest for the C4T project include: 5th generation aerial target and threat emulations, M&S for testing AI/ML decision engines validation techniques, emulate contested dense communication environments, and C4I and SW intensive systems joint mission thread test planning and evaluation through automated testing tool technologies. ***FY 2022 Plans:*** The C4T project will continue to advance test technology development to enable the next generation resilient, survivable, federated networks and information ecosystems (information superiority) from the tactical level up to strategic planning across three domains: BDA, Live and Simulated Environments, and Test Automation.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603941D8Z / *Test and Evaluation/Science and Technology*	**Project (Number/Name)** 096 / *C4I & Software Intensive Systems Test*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
C4T project will now focus on testing more advanced technologies to assess big data warfighter systems implementing advanced algorithms and computer architectures. C4T project additional focus to increase use of live and simulated test environments with test environment driven M&S validation techniques. C4T project additional focus to increase use of test automation utilizing virtualization and cloud environments. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increase to support advanced test technology development.			
Accomplishments/Planned Programs Subtotals	10.128	11.977	12.128

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603941D8Z / *Test and Evaluation/Science and Technology*	Project (Number/Name) 097 / *Autonomy and Artificial Intelligence Test*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
097: *Autonomy and Artificial Intelligence Test*	55.008	11.141	10.648	11.087	-	11.087	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Starting in FY 2020, Project 097 title changed 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, and bring special challenges for testers of Artificial Intelligence systems. 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 AAIT 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 2020	FY 2021	FY 2022
Title: Autonomy and Artificial Intelligence Test	11.141	10.648	11.087
Description: The AAIT Project continued test technology development supporting the 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. The AAIT Project seeks solutions for legacy topics (test planning, test execution, safety, and performance assessment) but has also expanded our interest to ensure			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603941D8Z / *Test and Evaluation/Science and Technology*	**Project (Number/Name)** 097 / *Autonomy and Artificial Intelligence Test*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
solutions for Artificial Intelligence and Machine Learning systems, topics identified by the intelligence community, and any other topics that are priority for TRMC and OUSD(R&E). The AAIT project initiated the Assured Development and Operation of Autonomous Systems (ADAS) effort. ADAS addresses the unique challenges of Autonomy test & evaluation to provide enterprise solutions in support of future programs. ADAS address autonomy test and evaluation verification and validation (TEV&V) needs across the full life cycle of an autonomy program from warfighter need identification to concept development and deployment. ADAS is exploring opportunities that support the overarching Autonomy T&E vision & strategy with actionable activity in requirements elicitation and formal modeling, linking formal models to implementation, composition for assurance, human autonomy interaction, development security operations, and simulation based test, live virtual constructive test, and integrated autonomous systems test. 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 safety-related vulnerabilities and failures within UAS software. The AAIT project is risk reducing Autonomy, Integration, and Teaming (AIT) test capability development, by providing autonomy test tools to be demonstrated on the Airborne Collision Avoidance System (ACAS-Xu) on Triton, and to test the Guardian Ground Based Detect and Avoid software, which will allow it to achieve certification for use during live test (DO-278A/NAVAIR Cert). The same technologies are risk reducing Autonomous Systems Test Capability (ASTC) development. The AAIT project used DARPA Collaborative Operations in Denied Environments (CODE) as a test case for this robustness technology, identifying and reporting on safety vulnerabilities found deep within the software, further identifying the conditions required to trigger the safety defects. The AAIT Project completed development of technology to improve test planning for 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. The AAIT Project is initiated development of technology to create machine-learned, behavioral copies of autonomy software. This technology creates faster-than-real-time versions of a given autonomy that can then be tested in an accelerated timeline in a simulated environment, and can also be cloned to be tested in parallel-processing fashion. This technology will provide faster, better, and more statistically significant testing data for testers.			
FY 2021 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603941D8Z / *Test and Evaluation/Science and Technology*	**Project (Number/Name)** 097 / *Autonomy and Artificial Intelligence Test*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
The AAIT project will continue to initiate and develop technologies to support test planning, test execution, and performance assessment of unmanned, autonomous, artificial intelligence, and machine learning systems. AAIT will continue ADAS development across the full spectrum of TEV&V needs. AAIT will continue to transition technologies to end users at the labs and ranges of the MRTFB. The AAIT Project will initiate efforts to address artificial intelligence topics related to the performance and vulnerabilities of image classifiers, improved safety of autonomous systems on live test ranges, and continuous validation of advanced learning-in-the-field artificial intelligence systems. ***FY 2022 Plans:*** The AAIT Project will continue to initiate and develop technologies to support test planning, test execution, and performance assessment of unmanned, autonomous, artificial intelligence, and machine learning systems. AAIT will continue ADAS development across the full spectrum of TEV&V needs. AAIT will continue to transition technologies to end users at the labs and ranges of the MRTFB. AAIT will continue to risk reduce test capability development. AAIT will investigate concepts to verify the autonomy design models against design requirements using formal methods, and a Test-Case Execution Environment based on AI-guided Testing, using machine-learning in the test planning process to make recommendations of test conditions for evaluation of machine learning image classifiers. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increase to support test technologies of unmanned and autonomous systems.			
Accomplishments/Planned Programs Subtotals	11.141	10.648	11.087

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603941D8Z / *Test and Evaluation/Science and Technology*	Project (Number/Name) 098 / *Cyberspace Test*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
098: *Cyberspace Test*	38.360	15.001	13.170	13.348	-	13.348	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

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 2020	FY 2021	FY 2022
Title: Cyberspace Test	15.001	13.170	13.348
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 2021 Plans: The CTT project will continue to pursue technology developments addressing needs in Cyber-Physical Systems, in Tactical Edge Networks, and in Enterprise Information Systems. This includes the capacity to verify that an aircraft's avionics have not been altered from a cyber attack. CTT also plans to initiate an effort to test the behavior of malware. CTT will initiate an effort to fuzz up virtualized targets. CTT will initiate an effort to reverse engineer firmware.			
FY 2022 Plans: The CTT project will continue to pursue technology developments addressing needs in Cyber-Physical Systems, in Tactical Edge Networks, and in Enterprise Information Systems. This includes the capacity to verify that an aircraft's avionics have not been			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603941D8Z / *Test and Evaluation/Science and Technology*	**Project (Number/Name)** 098 / *Cyberspace Test*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
altered from a cyber attack. CTT also plans to initiate an effort to test the behavior of malware. CTT will initiate an effort to fuzz up virtualized targets. CTT will initiate an effort to reverse engineer firmware. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increase to support technological developments within Cyber-Physical Systems, Tactical Edge Networks, and Enterprise Information Systems.			
Accomplishments/Planned Programs Subtotals	15.001	13.170	13.348

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603941D8Z / *Test and Evaluation/Science and Technology*	Project (Number/Name) 099 / *Space Test*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
099: *Space Test*	0.000	0.000	0.000	0.500	-	0.500	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

As a new start in FY 2022, the Space Test project mission is to address national test capability gaps by providing accurate, robust, and efficient T&E solutions to successfully develop, validate, and inform the employment of new space control systems. The space domain has become a competitive, congested, and contested environment dominated by global economics and key to national security. The Department of Defense (DoD) is prioritizing investments to maintain space superiority and increase resiliency of legacy space systems as well as new space control systems. Current developments focus on deploying capabilities and systems to deter aggression and maintain freedom of action in space for the US, allies, and partner nations. Current testing infrastructure and methodologies to assess space system resilience against emerging threats is limited. The Space Test project addresses test technology needs for adequate realism for space systems and aligns with the DoD S&T priority investments. The Space Test project is developing a strategic roadmap and investment strategy to establish live and virtual range environments, develop space and ground-based threat emulation capabilities. The Space Test project develops technologies to enable robust, accurate, and timely T&E of future space weapon systems, and to ensure system suitability and survivability. Current test resource capability and capacity preclude accurate determination of future space system lethality and survivability.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Space Test	0.000	0.000	0.500
Description: The Space Test (ST) project is conducting a test infrastructure gap analysis on the needs of testing space systems and is developing a time-phased investment strategy based on those requirements. Work includes engaging the space test community on needs and gaps to ensure traceability of test technology development to strategic objectives. ***FY 2021 Plans:*** The Space Test project will continue the detailed gap analysis and development of a time-phased investment plan. ***FY 2022 Plans:*** Stand up a Space Test Project within the T&E/S&T Program to pursue technology developments addressing test needs in Space Systems across DoD and National Organizations. Execute Space T&E investment roadmap and time-phased investment strategy. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Increase supports Space Test as a new start in FY 2022.			
Accomplishments/Planned Programs Subtotals	0.000	0.000	0.500

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603941D8Z / *Test and Evaluation/Science and Technology*	**Project (Number/Name)** 099 / *Space Test*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

THIS PAGE INTENTIONALLY LEFT BLANK

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603950D8Z / *National Security Innovation Network*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	0.000	37.658	40.000	21.270	-	21.270	-	-	-	-	-	-
845: *National Security Innovation Network*	0.000	37.658	40.000	21.270	-	21.270	-	-	-	-	-	-

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 and authorized through Section 219 of the FY 2021 NDAA. NSIN reports through the Defense Innovation Unit (DIU) to the Undersecretary of Defense for Research and Engineering. NSIN has been chartered with a mission to build networks of innovators that generate new solutions to national security problems. NSIN develops programs 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 from academia and the start-up community. 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's physical network is composed of 11 Regional Directors, each of which is located in critical venture innovation hubs throughout the country (Boston, MA; New York City, NY; 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 executes a suite of 12 programs (e.g., Hacking for Defense) and 7 pilot activities (see below) with annual costs of approximately $40.000 million, inclusive of the personnel that support program planning, execution, and assessment.

NSIN has been a continuous Congressional interest program that has received funding in FY 2016 ($5.000 million), FY 2017 ($25.000 million), FY 2018 ($25.500 million), FY 2019 ($15.000 million), FY 2020 ($40.000 million), and FY 2021 ($40.000 million). In prior years, NSIN was predominantly funded through Congressional Additions but was included in the President’s Budget submission for FY 2020 ($25.000 million). FY 2022 is the first year that NSIN appears as a funded Program Element throughout the FYDP and its program mission was codified in Section 219 of the FY 2021 NDAA.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603950D8Z *I National Security Innovation Network*

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	40.000	0.000	0.000	-	0.000
Current President's Budget	37.658	40.000	21.270	-	21.270
Total Adjustments	-2.342	40.000	21.270	-	21.270
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	40.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-0.948	-			
• SBIR/STTR Transfer	-1.387	-			
• Cancelled Account	-0.007	-	-	-	-
• Program Adjustment	-	-	21.270	-	21.270

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2020	FY 2021
Project: 845: *National Security Innovation Network*		
Congressional Add: *NSIN*	15.000	40.000
Congressional Add Subtotals for Project: 845	15.000	40.000
Congressional Add Totals for all Projects	15.000	40.000

Change Summary Explanation

FY 2022 increase supports the National Security Academic Accelerator (NSA2) program, expands H4D efforts, expands the Propel program, and pilots additional program concepts in partnership with the Office of Small Business Programs, ManTech, SBIR office and offices of the Deputy Director of Research and Engineering for Modernization.

FY 2021 increase supports the expansion of the Hacking for Defense (H4D) program, expansion of the X-Force Fellowship Program, the inaugural cohort of the Technology and National Security Fellowship (TNSF), National Security Academic Accelerator (NSA2) Pilot activities, and the acquisition and use of commercial platforms that assist with due diligence of NSIN’s early-stage venture partners and counter foreign influence and investment.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603950D8Z / *National Security Innovation Network*	Project (Number/Name) 845 / *National Security Innovation Network*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
845: *National Security Innovation Network*	0.000	37.658	40.000	21.270	-	21.270	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

NSIN executes the following programs and pilot activities, all of which are designed to enhance DoD's access to technologists and entrepreneurs for the purposes of improving its talent pool, collaborate with universities and the early-stage venture community to develop novel concepts and solutions to end-user problems and requirements, and prototype and test new technologies to place them on the path to becoming programs of record or integrated with existing platforms.

- Technology and National Security Fellowship: a national, one-year fellowship that places STEM graduates into the immediate offices of policy makers in Congress and the Pentagon for the purposes of enhancing technical literacy and improving policy outcomes through informed understanding of emerging and nascent technologies.
- Hirethon: a national program that leverages NSIN's existing and emerging network to pair exceptionally qualified candidates with DoD mission partners that plan to use direct or expedited hiring authorities to aid in job placement.
- X-Force Fellowship: a summer fellowship experience for current students that embeds project-based teams of graduate and undergraduate students with DoD mission partners for the purposes of developing early-stage prototypes. Occurs annually from June-August.
- Hacks: a national program that provides early-stage concept development and proof of principle solutions to DoD mission partners through dedicated 54-hour hackathons operated in conjunctions with top universities and start-ups throughout the country.
- Bootcamp: a national program that provides crowd-sourced solutions for DoD mission partners by deploying faculty from top tier research universities to bases and installations to facilitate early-stage concepts for technology and policy-based problems.
- Capstone: a national program that pairs prototyping development needs for DoD mission partners with extant engineering capstone courses from top tier research universities throughout the country. Outputs include TRL-4 prototypes that can undergo testing and evaluation.
- Starts: a national program that showcases high-TRL technologies to DoD mission partners for the purposes of enhanced tech scouting and improving technical capability gaps. Teams and companies with the technology that best meets a DoD mission partner's needs are awarded initial prototyping or testing contracts.
- Propel: a national program that partners with commercial incubators and accelerators to sponsor particularly promising technology and early-stage ventures into cohort-based customer discovery that improves DoD end user validation.
- National Security Academic Accelerator (NSA2): a national pilot that identifies extant university IP, matches it against DoD mission partner needs, and then commercializes the technology through entrepreneurial training, recruitment, and licensing agreements. Currently being executed at four pilot sites with the intent to expand it to an additional six (6) sites in FY 2022.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: National Security Innovation Network (NSIN)	22.658	-	21.270

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603950D8Z / *National Security Innovation Network*	**Project (Number/Name)** 845 / *National Security Innovation Network*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
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. ***FY 2022 Plans:*** In addition to executing programs and pilots with its DoD mission partners, NSIN will: • Establish 15 project sites for the National Security Academic Accelerator (NSA2) program in as many states. • Expand H4D efforts with NATO and other partners and allies including India, Japan, Australia, New Zealand, and Canada. • Expand the Propel program, which partners with commercial incubators and accelerators to sponsor early-stage dual-use ventures of DoD interest to up to 15 different sites throughout the United States. • Pilot additional program concepts in partnership with the Office of Small Business Programs, ManTech, SBIR office and offices of the Deputy Director of Research and Engineering for Modernization. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The FY 2022 minor reduction is due to inflation rate adjustments.			
Accomplishments/Planned Programs Subtotals	22.658	-	21.270

	FY 2020	FY 2021
Congressional Add: NSIN	15.000	40.000
FY 2020 Accomplishments: • Supported more than 250 early-stage ventures from 46 states participated in NSIN programs that have never done business with DoD • Integrated more than 3,500 new problem solvers into DoD concept development in the form of students, faculty, and entrepreneurs from the private sector • Launched more than 50 dual-use ventures using existing technology from DoD laboratories, resulting in an average annual improvement of ~15% for commercialization rates from the DoD laboratories • Supported technology transition through partnerships with other DoD agencies, more than 67% of the 835 solutions fielded by NSIN are in some stage of transition. These solutions are supported by more than $240M in DoD mission partner funding and more than $300M in private capital funding. • Augmented the DoD Talent Pool by placing more than 175 people into temporary, term, and permanent STEM hiring actions within the national security enterprise. Of these about half (47%) were women or historically underrepresented minorities with STEM degrees.		
FY 2021 Plans: In addition to executing programs and pilots with its DoD mission partners, NSIN intends to:		

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603950D8Z / *National Security Innovation Network*	**Project (Number/Name)** 845 / *National Security Innovation Network*

	FY 2020	FY 2021
• Establish the Berkeley Institute for National Security Innovation (BINSI) at Cal-Berkeley, which will provide a course curriculum for graduate and undergraduate students in Technology and National Security and pilot a talent pipeline for STEAM positions within DoD. • Expand Hacking for Defense (H4D) to an objective state of delivery at more than 75 schools nationwide, including at least one site in every state, district, and territory. This includes piloting new partnerships through NATO and USEUCOM with allied universities to address NATO problem sets. • Expand current pilot efforts to deliver virtual, dual-use accelerator training for low-income areas to improve economic development opportunities and expand the National Security Innovation Base in AR, OK, MS, AL, TN, KY, and WV. • Expand current pilot efforts to convert extant university IP into dual-use commercial ventures by investing in six (6) additional project sites throughout the United States • Establish rapid prototyping sites in partnership with the ManTech program at six national institutes in five of NSIN's regions.		
Congressional Adds Subtotals	15.000	40.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

THIS PAGE INTENTIONALLY LEFT BLANK

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0604055D8Z / *Operational Energy Capability Improvement (OECI)*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	0.000	62.686	16.000	74.300	-	74.300	-	-	-	-	-	-
455: *Operational Energy Capability Improvement*	0.000	62.686	16.000	74.300	-	74.300	-	-	-	-	-	-

Note

The FY 2021 NDAA included a rescission note on pages 166-169, "The agreement modifies a provision proposed by the House recommending rescissions and provides for the rescission of $3,248,047,000." Per the FY21 NDAA rescission, the FY 2020 Operational Energy Capability Improvement Program Element was reduced by -$10 million to $54.900 million.

FY 2021 program funds were realigned in FY 2020 for higher departmental priorities under the Defense-Wide Review (DWR). However, in accordance with guidance in NDAA 2021 Section 322 “The Secretary of Defense shall include in the annual budget submission of the President under section 1105(a) of title 31, United States Code, a dedicated budget line item for fielding operational energy improvements, including such improvements for which funds from the Operational Energy Capability Improvement Fund have been expended to create the operational and business case for broader employment” funds are restored in the Presidential Defense Memorandum for FY 2022.

FY 2021 funds ($16 million) are congressional directed adds for nuclear fuel core development to support the PELE reactor maturation and also funding to support power and thermal management maturation for directed energy weapons.

For FY 2020, in accordance with guidance in NDAA 2020 Section 239, and in concert with the Strategic Environmental Research and Development Program/ Environmental Security Technology Certification Program (SERDP/ESTCP), the Operational Energy Capability Improvement (OECI) funds were rebalanced to implement Energy Storage and Tactical Micro-grids. With the FY 2021 rescission, $7.375 million in funding was rescinded. FY 2022 funding will be prioritized to complete these directed efforts in tactical micro-grid development and Energy storage to increase lethality and interoperability for Joint and Coalition warfighting.

A. Mission Description and Budget Item Justification

The Operational Energy Capability Improvement (OECI) project matures and demonstrates advanced technologies in operational energy across warfighting platforms and domains. Beginning in Fiscal Year 2020, the focus of this project was the culmination, demonstration and transition of all ongoing OECI efforts to service and agency partners.

Beginning in FY 2022, OECI will complete projects impacted by lack of funding due to the rescission and competitively award funding to support new projects in DoD Science and Technology Energy Strategy Focus areas of 1) Powering the Force, 2) Electrifying the Battlespace, and 3) Commanding Energy. Competitively awarded projects will continue to focus on multi-year technology maturation efforts. In FY 2022 1-year surge projects and 1-year studies that support OECI operational energy focus area and gap/seam requirements will also be awarded. These one-year efforts speed technologies to the warfighter and allow the OECI program to re-start rotational multi-year efforts. These investments address high priority joint operational energy requirements to ensure best-use of operational energy on the battlefield

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0604055D8Z *I Operational Energy Capability Improvement (OECI)*

informed, when and where possible, by climate change mitigation. Projects will increase the joint force's lethality and agility and reduce logistical burdens. These new capabilities are required to address threats from near peer enemies.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	64.900	0.000	0.000	0.000	0.000
Current President's Budget	62.686	16.000	74.300	0.000	74.300
Total Adjustments	-2.214	16.000	74.300	0.000	74.300
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	16.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Program Adjustment	-2.214	-	74.300	-	74.300

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2020	FY 2021
Project: 455: *Operational Energy Capability Improvement*		
Congressional Add: *Operational Energy Capability Improvement Program Increase*	0.000	16.000
Congressional Add Subtotals for Project: 455	0.000	16.000
Congressional Add Totals for all Projects	0.000	16.000

Change Summary Explanation

The $74.300 million increase in FY 2022 is for Energy Science and Technology efforts that improve agility and resiliency in suppling operational energy with advanced power, storage, and distribution technologies.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0604055D8Z / *Operational Energy Capability Improvement (OECI)*	Project (Number/Name) 455 / *Operational Energy Capability Improvement*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
455: *Operational Energy Capability Improvement*	0.000	62.686	16.000	74.300	-	74.300	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The basic mission of the OECI is to fund innovation that will improve DoD operational effectiveness via targeted S&T investments. As Defense-Wide funding, it incentivizes S&T to promote long term change in DoD capabilities so they are better aligned with the Operational Energy Strategy. OECI generally fosters innovation to improve operational energy performance and has two key mission aspects. First, to develop, demonstrate and transition into use operational energy technologies and practices that will improve DoD military capabilities and/or reduce costs. Second, to establish within the military Services sustainable, institutional capability to continue to research, develop and adopt operational energy innovations. OECI funds serve as “seed money” to start or consolidate promising operational energy programs to be sustained by the Services; accordingly, OECI generally emphasizes supporting or establishing programs, rather than one-off projects.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Operational Energy Capability Improvement (OECI)	62.686	-	74.300

Description: In FY 2021, OECI is continuing or completing more than 30 classified and unclassified projects including:
- Undersea thermal energy generation
- Long duration Unmanned Aerial Vehicles and Unmanned Ground Vehicles
- Power and Thermal Management for High Power / Pulse Power systems and integration

FY 2020 Accomplishments: Successful demonstration of an autonomous robotic refueling system is now transitioning to the Navy. Demonstrated complete diurnal cycle flight of a zero logistics fuel unmanned aerial vehicle with expected flight endurance of at least 72 hours. Completed transition and obtained follow-up funding of the tactical vehicle electrification kit to PM Transportation Systems, PM Joint Light Tactical Vehicle, PM Terminal High Altitude Area Defense, and PM Command Post Integrated Infrastructure.

FY 2022 Plans:
Operational Energy Capability Improvement will develop and demonstrate the most promising, innovative, and cost-effective technologies and
methods that address joint high priority operational energy requirements. OECI funding efforts will identify and mitigate energy-related risks and increase warfighting capabilities and resilience. OECI will invest in three focus areas:
- Powering the Force: Support the deployment of mobile and distributed operations with resilient and agile energy logistics in contested environments. Reduce the risks, vulnerability, and climate impacts of DoD’s dependence on fuel.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0604055D8Z / *Operational Energy Capability Improvement (OECI)*	**Project (Number/Name)** 455 / *Operational Energy Capability Improvement*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
• Electrifying the Battlespace: Enable the electrification of weapons, platforms, unmanned systems, and soldiers to field new weapon, sensing, active defense, and other technologies. Meet the growing demands of power across the battlespace. • Commanding Energy: Capture and understand energy profiles to transform the Joint Force from a reactive to a predictive energy management and control. Achieve real-time energy awareness and command and control at all levels. Additional projects in the three priority areas include: Powering the Force Investment focus: • Integrate hybrid-electric platform power into standardized tactical micro-grids; ruggedize portable renewables and energy harvesting technology alongside distributed battery energy storage; decrease the detectable signature and value of fuel movers and storage Benefits to the Department of these investments include more mobile and distributed operations with decreased logistics requirements and reduced the risk to personnel and equipment of carrying fuel into the fight, especially through contested environments. Electrifying the Battlespace Investment focus: • Improve ruggedized battery performance, to include standardization and safety; develop hybrid systems that include electrical propulsion; reduce the weight of personally carried batteries; improve the efficiency, reliability, and performance of wireless power beaming receivers and integrated systems • Develop advance power and thermal management technologies to meet the growing demands of high-power systems Benefits to the Department of these investments include further enabling the electrification of weapons, platforms, unmanned systems, soldiers, sensors, and other systems used by maneuver forces. This drastically reduces energy resupply risks, costs, and signatures to enable persistent unmanned systems and unattended sensors used for ISR. Commanding Energy Investment focus: • Integrate operational energy into mission modeling tools, war-gaming, and personnel development Benefits to the Department of these investments include analytic products used by operational planners to develop better mission and campaign pre-position, force flow and battlespace distribution plans; and by field commanders to better understand the energy profile of enemy forces and conduct real-time contingency planning to enable the joint force to manage and control battlespace energy in a more predictive and less reactive mode. The tools can provide field commanders options in response to enemy action not otherwise available, enabling actions that might be less predictable by enemy forces. Beginning in FY 2022, OECI will complete projects impacted by lack of funding due to the rescission including:			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0604055D8Z / *Operational Energy Capability Improvement (OECI)*	**Project (Number/Name)** 455 / *Operational Energy Capability Improvement*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
• Testing/evaluation of critical energy storage and micro grid control hardware that includes interoperability assessment/validation, understanding the efficiency and effectiveness of vendor agnostic inverters and energy storage devices, developing state-of-the-art advanced controllers and maturing the intelligent power distribution devices • Testing of the integrated hybrid micro grid system to validate/optimize electrical and dynamic operation and the functioning of equipment in extreme environments • Further developing metrology to enable large, lightweight, flexible electronically-steerable power arrays in space thereby impacting the ability to scale and provide power to expeditionary and other remote users to extend the reach and lethality of multi-domain platforms while reducing costly and vulnerable supply lines. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** NDAA 2021 SEC. 322. instructed the Secretary of Defense to include in the annual budget submission of the President under section 1105(a) of title 31, United States Code, a dedicated budget line item for fielding operational energy improvements, including such improvements for which funds from the Operational Energy Capability Improvement Fund.			
Accomplishments/Planned Programs Subtotals	62.686	-	74.300

	FY 2020	FY 2021
Congressional Add: Operational Energy Capability Improvement Program Increase	0.000	16.000
FY 2020 Accomplishments: Development of a DOD-wide high voltage energy storage module specification to enable a standardized battery architecture based on commercial technologies that will be applicable to multiple DOD platforms. Validation, qualification, and operational demonstration of Energy Efficient Multi-Mission Fuel/ISR/Strike Pods for unmanned aerial vehicles, per Combatant Command requirements. Accomplishments include: (1) Standardization to lower costs due to competition, ensures higher volume, and reduces sustainment burden (logistics, maintainability); (2) Electrification to increase maneuver (via improved fuel efficiency from electrical drive), higher survivability (silent mobility / watch, active protection systems), and increase in lethality (via directed energy maturation); and (3) Prototypes are scalable and interchangeable. The results of these projects were adopted by and transitioned to the Services. Energy Efficient Multi-Mission Fuel/ISR/Strike Pods show energy storage systems greatly increase flight endurance for unmanned aircraft systems. Redesigned UAS provides increased endurance/range/efficiency.		

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0604055D8Z / *Operational Energy Capability Improvement (OECI)*	**Project (Number/Name)** 455 / *Operational Energy Capability Improvement*

	FY 2020	FY 2021
Updates to: Prop, Drive Train, Fuel Pods, Aerodynamics and Fuel Injection to deliver >30% performance increase. These impacts were demonstrated and transitioned to the warfighter. ***FY 2021 Plans:*** Congressional Adds directed for nuclear fuel core development to support the PELE reactor maturation and also funding to support power and thermal management maturation for directed energy weapons. The Tri-structural Isotropic (TRISO) fuel line is a collaboration between DoD, NASA, and DOE. The first phase in the process is to establish the viability of a commercial TRISO fuel line that could be used by these agencies for any program, and to produce enough TRISO fuel to demonstrate throughput and quality control. The second phase is to purchase a nuclear reactor core for the PELE program. The Congressional Add for TRISO fuel production builds a nuclear fuel fabrication line, in support of DoD's Project Pele for modular nuclear reactors as well as supporting activities for NASA. This funding includes the purchasing of equipment, installation, and additional testing, which will lead to production of demonstration nuclear fuel beginning in FY22. Payoff will ensure a commercial TRISO fuel line is available for the PELE Nuclear Micro-Reactor to procure the nuclear reactor core when the Record of Decision for the program is complete. The Congressional Add for thermal and power technology develops thermal energy storage technologies that are more efficient, effective, and size weight and power superior. Demonstrations are planned for relevant (hundreds of kW magnitude) power levels, indicative of directed energy weapon engagement and load profiles. This work will demonstrate core technologies associated with the materials, interfaces, controls, and overall system integration, and then apply those lessons to larger scale prototypes that support laser scaling initiatives with higher lethality.		
Congressional Adds Subtotals	0.000	16.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0303310D8Z *I Countering Weapons of Mass Destruction (CWMD) Systems: Advance d Technology Development*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	249.898	27.878	0.000	0.000	-	0.000	-	-	-	-	-	-
004: *CWMD Systems: Advanced Technology Development*	249.898	27.878	0.000	0.000	-	0.000	-	-	-	-	-	-

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 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0303310D8Z *I Countering Weapons of Mass Destruction (CWMD) Systems: Advance d Technology Development*

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	28.907	0.000	0.000	-	0.000
Current President's Budget	27.878	0.000	0.000	-	0.000
Total Adjustments	-1.029	0.000	0.000	-	0.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Program Adjustment	-1.029	-	-	-	-

Change Summary Explanation

In FY 2021, this program was eliminated as a result of the Defense-wide Review.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0303310D8Z / *Countering Weapons of Mass Destruction (CWMD) Systems: Advanced Technology Development*	Project (Number/Name) 004 / *CWMD Systems: Advanced Technology Development*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
004: *CWMD Systems: Advanced Technology Development*	249.898	27.878	0.000	0.000	-	0.000	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

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 2020	FY 2021	FY 2022
Title: P*004 / CWMD Systems: Advanced Technology Development	27.878	0.000	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0303310D8Z / *Countering Weapons of Mass Destruction (CWMD) Systems: Advanced Technology Development*	**Project (Number/Name)** 004 / *CWMD Systems: Advanced Technology Development*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
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 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. ***FY 2021 Plans:*** FY20 Projects were completed, funding eliminated by 2019 Defense Wide Review. ***FY 2022 Plans:*** N/A ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Defense Wide Review eliminated funding to support the department priorities			
Accomplishments/Planned Programs Subtotals	27.878	0.000	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 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-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0303367D8Z / *Spectrum Access Research and Development*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	-	53.247	0.000	0.000	-	0.000	-	-	-	-	-	-
000: *Spectrum Relocation Funds*	-	53.247	0.000	0.000	-	0.000	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Funding supports Pre-Auctioned Spectrum relocation and sharing activities.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	0.000	0.000	-	0.000
Current President's Budget	53.247	0.000	0.000	-	0.000
Total Adjustments	53.247	0.000	0.000	-	0.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Transfer from Office of Management and Budget	53.247	-	-	-	-

Change Summary Explanation

Funds in the amount of $53.247 million in FY 2020 transferred in from Office of Management and Budget for the support of the Spectrum Relocation Funds.

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Pre-Auction Spectrum Relocation Fund	53.247	-	-
Description: Funding supports Pre-Auctioned Spectrum relocation and sharing activities.			
Accomplishments/Planned Programs Subtotals	53.247	-	-

D. Other Program Funding Summary ($ in Millions)

N/A

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0303367D8Z *I Spectrum Access Research and Development*

D. Other Program Funding Summary ($ in Millions)

Remarks

E. Acquisition Strategy

N/A

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603161D8Z / *Nuclear and Conventional Physical Security/National Technical Nuclear Forensics*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	296.585	41.768	32.616	28.687	-	28.687	-	-	-	-	-	-
162: *Nuclear and Conventional Physical Security*	254.543	34.502	24.654	21.317	-	21.317	-	-	-	-	-	-
040: *National Technical Nuclear Forensics Systems*	42.042	0.128	1.725	7.370	-	7.370	-	-	-	-	-	-
041: *CNT Prevention ADC&P*	-	7.138	6.237	0.000	-	0.000	-	-	-	-	-	-

Note

Funding transferred from Countering Nuclear Threats (CNT) to National Technical Nuclear Forensics (NTNF), P040. 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 Department of Defense (DoD) (and by default, the U.S. Government's (USG)) already limited ability to effectively and reliably execute the nuclear forensics mission. As the lead for providing the USG's post-detonation nuclear forensics capability, DoD is emphasizing the importance of this mission in deterring adversaries and ensuring success of the USG's post-detonation NTNF mission.

A. Mission Description and Budget Item Justification

Nuclear and Conventional Physical Security/National Technical Nuclear Forensics 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 NTNF 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 conventional physical security materiel solutions for the Department are 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 Program 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.

Per Presidential Policy Directive 42, Annex C, the DoD provides the USG post-detonation NTNF capability. Per DoD Directive 2060.04, the Office of the Undersecretary of Defense for Acquisition & Sustainment (OUSD(A&S)) is the office responsible for developing and leading DoD’s NTNF capabilities. Ensuring the USG can identify the source of nuclear material and hold those responsible for an attack accountable is critical to our national defense and security. Internal and independent assessments indicate new capabilities are needed to sustain an effective deterrent against nuclear attack and meet the challenges of future threats. This PE is the only DoD Research, Development, Test, and Evaluation (RDT&E) program focused on Advanced Component Development & Prototypes for post-detonation NTNF capabilities and without proper funding, DoD’s ability to meet this critical deterrence need will be significantly degraded.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603161D8Z *I Nuclear and Conventional Physical Security/National Technical Nuclear Forensics*

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.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	42.695	32.636	32.130	-	32.130
Current President's Budget	41.768	32.616	28.687	-	28.687
Total Adjustments	-0.927	-0.020	-3.443	-	-3.443
• Congressional General Reductions	-	-0.020			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-0.927	-			
• SBIR/STTR Transfer	-	-			
• Program Adjustments	-	-	-3.443	-	-3.443

Change Summary Explanation

The adjustment made from FY 2021 to FY 2022 is to internally realign funds within the department for National Defense Strategy priorities and other program adjustments.

The FY 2022 funding request was reduced by $7.449 million to account for the availability of prior year execution balances.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0603161D8Z / *Nuclear and Conventional Physical Security/National Technical Nuclear Forensics*	Project (Number/Name) 162 / *Nuclear and Conventional Physical Security*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
162: *Nuclear and Conventional Physical Security*	254.543	34.502	24.654	21.317	-	21.317	-	-	-	-	-	-
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 materiel solutions for the Department are 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 (PSEAG) is responsible for avoiding duplication of effort, ensuring systems integration, and promoting interoperability and sustainability.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Detection and Assessment	19.171	13.092	12.754
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. 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. ***FY 2021 Plans:*** • Complete integration of the PIDS suitable for nuclear and non-nuclear security requirements for the U.S. Air Force and NNSA.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603161D8Z / *Nuclear and Conventional Physical Security/National Technical Nuclear Forensics*	**Project (Number/Name)** 162 / *Nuclear and Conventional Physical Security*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
• Develop a system that produces high-quality underwater images enabling human assessment of underwater threats at ranges up to 70 feet. • Develop an algorithm to automatically classify alarms to quickly present valid alarms, reduce the occurrences of invalid alarms, and test in an operationally relevant waterside security environment. ***FY 2022 Plans:*** • Complete the development of a system that produces high-quality underwater images enabling human assessment of underwater threats at ranges up to 70 feet. • Complete the development of an algorithm to automatically classify alarms to quickly present valid alarms, reduce the occurrences of invalid alarms, and test in an operationally relevant waterside security environment. • Assess and demonstrate the application of small Unmanned Aerial System's use in performing Physical Security Assessment of intrusions in remote areas such as perimeters and enclaves that are protected by an Intrusion Detection System (IDS), but are not equipped with co-located physical security assessment (i.e. EO/IR) equipment. • Improve the AN/WQX-2 harbor security sonar's ability to detect Unmanned Underwater Vehicles by exploiting developments in the AN/WQX-2 sonar hardware refresh project. • Combine the unique capabilities Wide Area Surveillance & Detection System and pursue the integration of RADAR technology to provide operational capability in adverse weather conditions. • Develop Deep Learning Real Time Adaptive Learning Monitoring of Sound Velocity Profile to optimize a harbor security system's detection range capabilities. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The decrease in FY 2022 is the result of an internal realignment of funds within the department for National Defense Strategy priorities.			
Title: Access Controls ***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. 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	6.321	4.954	2.745

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603161D8Z / *Nuclear and Conventional Physical Security/National Technical Nuclear Forensics*	**Project (Number/Name)** 162 / *Nuclear and Conventional Physical Security*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
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 attempting to gain installation access. ***FY 2021 Plans:*** • 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. ***FY 2022 Plans:*** • Develop an effective and affordable Automated Installation Entry pre-enrolled express lane capability that can increase vehicle throughput and reduce security personnel without reducing access control point security. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The decrease in FY 2022 is the result of an internal realignment of funds within the department for National Defense Strategy priorities.			
Title: Installation and Transport Security ***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. 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 incident. U.S. 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. ***FY 2021 Plans:*** • 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. ***FY 2022 Plans:***	0.451	0.354	0.488

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603161D8Z / *Nuclear and Conventional Physical Security/National Technical Nuclear Forensics*	**Project (Number/Name)** 162 / *Nuclear and Conventional Physical Security*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
• Complete the evaluation of an 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. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The increase in FY 2022 is the result of an internal realignment of funds within the department for National Defense Strategy priorities.			
Title: Storage and Safeguards ***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. 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. ***FY 2021 Plans:*** • Complete development of a security container for critical documents on aircraft through a concept demonstration. ***FY 2022 Plans:*** • The Combatant Commands and the Services did not identify any material needs for this Budget Activity/Capability Area ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The decrease in FY 2022 is the result of an internal realignment of funds within the department for National Defense Strategy priorities.	0.500	0.500	0.000
Title: Prevention ***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. 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.	2.916	2.385	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603161D8Z / *Nuclear and Conventional Physical Security/National Technical Nuclear Forensics*	**Project (Number/Name)** 162 / *Nuclear and Conventional Physical Security*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
FY 2021 Plans: • Complete the integration of the 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. ***FY 2022 Plans:*** • The Combatant Commands and the Services did not identify any material needs for this Budget Activity/Capability Area ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The decrease in FY 2022 is the result of an internal realignment of funds within the department for National Defense Strategy priorities.			
Title: Decision Support Systems	3.551	2.721	4.773
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, projects related to the creation and enhancement of common operating pictures, and the establishment of common architectures / interface standards. 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. ***FY 2021 Plans:*** • Develop a capability to allow a user to see color images at night by leveraging an electro-optical camera that is more cost effective than the commonly used infrared cameras. ***FY 2022 Plans:*** • Complete the development of a capability to allow a user to see color images at night by leveraging an electro-optical camera that is more cost effective than the commonly used infrared cameras. • Develop, test and evaluate an Electronic Security Systems Information Management System to track physical security. • Develop a mobile interface providing real-time situational awareness to blue force personnel by using a two way communication device which is fixed to blue force's arm or vehicle mount.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603161D8Z / *Nuclear and Conventional Physical Security/National Technical Nuclear Forensics*	**Project (Number/Name)** 162 / *Nuclear and Conventional Physical Security*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
• Conduct formal testing of COTS Ground-Based Threat Detection Radar software that claims to provide filters and algorithms to reduce nuisance and false alarm rates in maritime application environments. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The increase in FY 2022 is the result of an internal realignment of funds within the department for National Defense Strategy priorities.			
Title: Analytical Support ***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. 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. ***FY 2021 Plans:*** • 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. ***FY 2022 Plans:*** • Complete Next Generation Electronic Security System project to identify new sensor technology for use in future security systems. Leverage industry (e.g. automotive and autonomous operations) to identify low cost solutions. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The decrease in FY 2022 is the result of an internal realignment of funds within the department for National Defense Strategy priorities.	1.592	0.648	0.557
Accomplishments/Planned Programs Subtotals	34.502	24.654	21.317

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603161D8Z / *Nuclear and Conventional Physical Security/National Technical Nuclear Forensics*	**Project (Number/Name)** 162 / *Nuclear and Conventional Physical Security*

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0603161D8Z / *Nuclear and Conventional Physical Security/National Technical Nuclear Forensics*	Project (Number/Name) 162 / *Nuclear and Conventional Physical Security*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Prior Years - Closed Out Efforts	Various	Various : Various	201.433	-		-		-		-		-	-	-	-
Tactical Security System	MIPR	Multiple Performers : Multiple Locations	4.345	1.150		-		-		-		-	-	-	-
Portable Intrusion Detection System	MIPR	AFLCMC : Hanscom AFB, MA	3.962	1.000		-		-		-		-	-	-	-
Physical Security Enterprise & Analysis Program	Various	Multiple Performers : Multiple Locations	10.192	-		0.267		2.813		-		2.813	Continuing	Continuing	-
Virtual Reality Synthetic Boat and Warning Shot Simulator	MIPR	Multiple Performers : Multiple Locations	0.839	0.131		-		-		-		-	-	-	-
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	1.119	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		-		-		-	-	-	-
Counter UAS Capability for DoD	MIPR	Various Performers : Various Locations	-	4.868		5.500		-		-		-	-	-	-
Wide Area Surveillance & Detection System with Light Detection and Ranging	MIPR	TBD : TBD	-	2.000		1.000		-		-		-	-	-	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0603161D8Z / *Nuclear and Conventional Physical Security/National Technical Nuclear Forensics*	Project (Number/Name) 162 / *Nuclear and Conventional Physical Security*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Mobile Underwater Threat Imaging System	MIPR	TBD : TBD	-	0.860		0.610		-		-		-	-	-	-
Real-Time Video Enhancement Software	MIPR	TBD : TBD	-	1.200		1.300		-		-		-	-	-	-
Affordable Counter Small UAS Situational Awareness	MIPR	TBD : TBD	-	1.600		1.400		-		-		-	-	-	-
Handheld Force Protection Command and Control	MIPR	TBD : TBD	-	0.900		1.200		-		-		-	-	-	-
Light Detection and Ranging Change and Shape Detection	MIPR	TBD : TBD	-	1.500		1.300		-		-		-	-	-	-
Automated Unmanned Ground Vehicle for Patrol & Security	MIPR	TBD : TBD	-	0.600		0.600		-		-		-	-	-	-
Effective/Affordable Night Time Color Camera	MIPR	TBD : TBD	-	1.500		1.300		-		-		-	-	-	-
Marine Mammal Program/ Cooperative Vigilance	MIPR	TBD : TBD	-	0.747		0.695		-		-		-	-	-	-
Integrated Multi-Sensor Perimeter Awareness with Intelligent Light Detection and Ranging System of Systems	MIPR	TBD : TBD	-	0.850		0.750		-		-		-	-	-	-
Near-Shore Unified Tactical Response (NUTR) Battlefield Objective Navigation Display (BOND)	MIPR	TBD : TBD	-	0.300		0.300		-		-		-	-	-	-
Security Controlled Unmanned Aerial Airfield System	MIPR	TBD : TBD	-	0.840		0.814		-		-		-	-	-	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0603161D8Z / *Nuclear and Conventional Physical Security/National Technical Nuclear Forensics*	Project (Number/Name) 162 / *Nuclear and Conventional Physical Security*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Automated Installation Entry Multiple Authentication Fast Lanes	MIPR	TBD : TBD	-	-		-		2.027		-		2.027	Continuing	Continuing	-
Deep Learning Real Time Adaptive Learning Monitoring of Sound Velocity Profile	MIPR	TBD : TBD	-	-		-		1.530		-		1.530	Continuing	Continuing	-
Development, Test and Evaluation of an Electronic Security Systems Information Management System	MIPR	TBD : TBD	-	-		-		1.444		-		1.444	Continuing	Continuing	-
Electronic Harbor Security System–Sensor Track Fusion	MIPR	TBD : TBD	-	-		-		0.854		-		0.854	Continuing	Continuing	-
Enterprise Ready Tactical Assault Kit	MIPR	TBD : TBD	-	-		-		2.750		-		2.750	Continuing	Continuing	-
Improved UUV Detection and Tracking Using the AN/WQX-2 Sonar	MIPR	TBD : TBD	-	-		-		1.950		-		1.950	Continuing	Continuing	-
Next Generation Electronic Security System	MIPR	TBD : TBD	-	-		-		1.200		-		1.200	Continuing	Continuing	-
Self Homing and Event Triggered / Assessment DroneAerial PS Assessment	MIPR	TBD : TBD	-	-		-		1.275		-		1.275	Continuing	Continuing	-
Wide Area Surveillance & Detection System with Radar	MIPR	TBD : TBD	-	-		-		1.386		-		1.386	Continuing	Continuing	-
Sonar Navigated Autonomous Grabber	MIPR	TBD : TBD	-	-		-		1.546		-		1.546	Continuing	Continuing	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603161D8Z / *Nuclear and Conventional Physical Security/National Technical Nuclear Forensics*	**Project (Number/Name)** 162 / *Nuclear and Conventional Physical Security*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Automated Neural Classification of Seismic and Acoustic Sensors	MIPR	TBD : TBD	-	-		-		1.337		-		1.337	Continuing	Continuing	-
		Subtotal	223.650	24.857		19.442		20.112		-		20.112	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Prior Years Completed Efforts	Various	Various Performers : Various Locations	5.436	-		-		-		-		-	-	-	-
Nuclear Security Subject Matter Experts	MIPR	Applied Research Laboratories, The University of Texas : Austin, Texas	1.370	0.225		0.225		-		-		-	-	-	-
Nuclear Matters Analytical Cell for Nuclear Deterrence	IA	DOE/Sandia National Laboratory : Albuquerque, NM	3.000	4.200		-		-		-		-	-	-	-
Nuclear Matters SIRC/ NDERG Support	Option/ T&M	SAIC : McLean, VA	2.200	0.166		-		-		-		-	-	-	-
Nuclear Matters Technical Support	IA	Department of Health and Human Services : Bethesda, MD	1.633	1.500		-		-		-		-	-	-	-
PSEAG Support	MIPR	Air Force Civil Engineer Center : Tyndall AFB, FL	-	0.575		0.575		-		-		-	-	-	-
Nuclear Matters/PSEAG Support	MIPR	TBD : TBD	-	-		1.762		-		-		-	-	-	-
DoD Electronic Security System Analysis	MIPR	Office of Naval Research : TBD	-	0.450		-		-		-		-	-	-	-
PSEAG Interoperability	MIPR	TBD : TBD	-	-		-		0.455		-		0.455	Continuing	Continuing	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603161D8Z / *Nuclear and Conventional Physical Security/National Technical Nuclear Forensics*	**Project (Number/Name)** 162 / *Nuclear and Conventional Physical Security*

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
		Subtotal	13.639	7.116		2.562		0.455		-		0.455	Continuing	Continuing	N/A

Remarks

NA

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Prior Years Completed Efforts	Various	Multiple Performers : Multiple Locations	10.687	-		-		-		-		-	Continuing	Continuing	-
Test & Evaluation Oversight	MIPR	SPAWARSYSCEN Atlantic : Charleston, SC	-	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		-		-		-	Continuing	Continuing	-
Development, Test and Evaluation of an Electronic Security Systems Information Management System	MIPR	TBD : TBD	-	0.690		0.750		-		-		-	Continuing	Continuing	-
Electronic Harbor Security System-Sensor Track Fusion	MIPR	Applied Research Laboratory/University of Texas (Through NAVSEA) : Austin, TX	-	0.750		0.300		-		-		-	Continuing	Continuing	-
Next Generation Electronic Security System	MIPR	NIWC-LANT : Charleston, SC	-	-		0.700		-		-		-	Continuing	Continuing	-
Test & Evaluation of Maritime Application Environment Radar	MIPR	TBD : TBD	-	-		-		0.750		-		0.750	Continuing	Continuing	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603161D8Z / *Nuclear and Conventional Physical Security/National Technical Nuclear Forensics*	**Project (Number/Name)** 162 / *Nuclear and Conventional Physical Security*

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
		Subtotal	10.687	2.065		2.375		0.750		-		0.750	Continuing	Continuing	N/A

Remarks

NA

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Prior Years - Completed Efforts	Various	Multiple Performers : Multiple Locations	6.567	-		-		-		-		-	Continuing	Continuing	-
Management Services	TBD	Multiple Performers : Multiple Locations	-	0.464		0.275		-		-		-	Continuing	Continuing	-
		Subtotal	6.567	0.464		0.275		-		-		-	Continuing	Continuing	N/A

Remarks

NA

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	254.543	34.502		24.654		21.317		-		21.317	Continuing	Continuing	N/A

Remarks

NA

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603161D8Z / *Nuclear and Conventional Physical Security/National Technical Nuclear Forensics*	**Project (Number/Name)** 162 / *Nuclear and Conventional Physical Security*

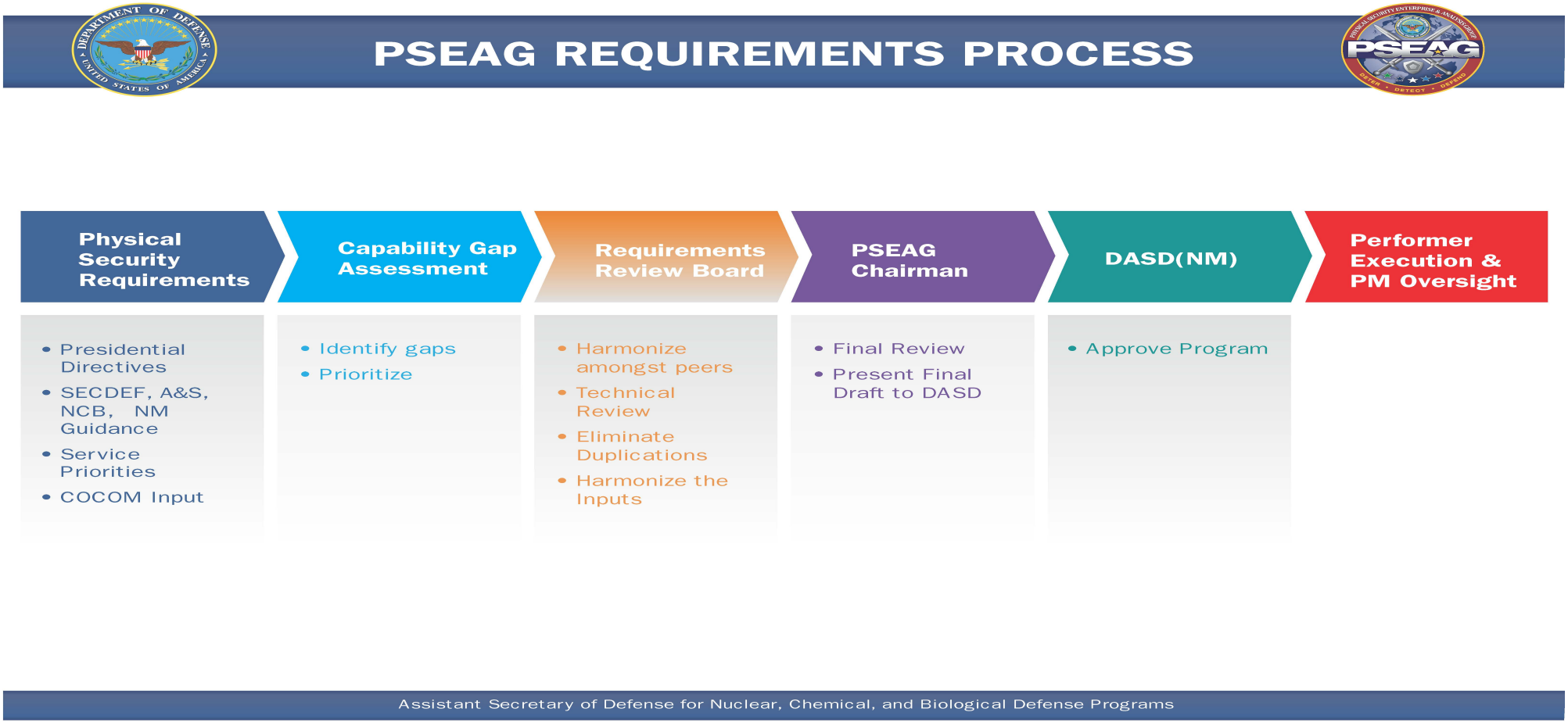


Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603161D8Z / *Nuclear and Conventional Physical Security/National Technical Nuclear Forensics*	**Project (Number/Name)** 162 / *Nuclear and Conventional Physical Security*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Access Control				
Access Control	1	2013	4	2026
Analytical Support				
Analytical Support	1	2013	4	2026
Decision Support				
Decision Support	1	2013	4	2026
Detection & Assessment				
Detection & Assessment	1	2013	4	2026
Installation & Transport Security				
Installation & Transport Security	1	2013	4	2026
Prevention				
Prevention	1	2013	4	2026
Storage & Safeguards				
Storage & Safeguards	1	2013	4	2026

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0603161D8Z / *Nuclear and Conventional Physical Security/National Technical Nuclear Forensics*	Project (Number/Name) 040 / *National Technical Nuclear Forensics Systems*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
040: *National Technical Nuclear Forensics Systems*	42.042	0.128	1.725	7.370	-	7.370	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Funding transferred from CNT to NTNF, P040. 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 (and by default, the U.S. Government's) ability to execute the nuclear forensics mission and deter adversaries. As the lead for providing the USG's post-detonation nuclear forensics capability, DoD is emphasizing the importance of this mission to ensure success.

Prior Year, FY 2020, and FY 2021 funding includes the funding associated with the CNT program.

A. Mission Description and Budget Item Justification

Per Presidential Policy Directive 42, Annex C, the DoD provides the USG post-detonation NTNF capability. Per DoDD 2060.04, OUSD(A&S) is the DoD office responsible for DoD's NTNF capabilities. This program is the only DoD RDT&E program focused on Advanced Component Development & Prototypes for NTNF capabilities.

Ensuring the USG can identify the source of nuclear material and hold those involved or supporting an attack accountable 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, timely national response to a nuclear event and to prevent future attacks. An effective attribution capability ensures potential adversaries know that they will be held accountable if they use proxies or other non-traditional delivery of nuclear weapons against the U.S., U.S. interests, or allies. Both internal and independent studies indicate that continued improvement to the USG's NTNF capabilities is needed to sustain a credible deterrent against an attempted or actual nuclear attack.

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 in this area is limited by capacity and technical expertise. In FY 2018, Departments and Agencies began to shift research and development from NTNF to other mission areas, which resulted in degradation of the DoD's (and by default, the USG's) ability to execute the nuclear forensics mission and deter adversaries through the attrition of technical experts vital to the response. Sustained support of DoD's NTNF mission is crucial to not only preventing attrition of current capabilities and knowledge base, but in ensuring that this critical and unique deterrence capability is not lost, putting the security of the nation and the ability to deter specific kinds of nuclear attack at risk.

This PE can fund travel to support the requirements of this program.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603161D8Z / *Nuclear and Conventional Physical Security/National Technical Nuclear Forensics*	**Project (Number/Name)** 040 / *National Technical Nuclear Forensics Systems*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: NTNF Capability Development	0.128	1.725	7.370
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. 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. ***FY 2021 Plans:*** - Advance the development of passive capabilities to address prompt detection gaps. - Advance the 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. ***FY 2022 Plans:*** - Further develop and transition technologies to address prompt detection gaps. - Advance DoD NTNF laboratory and collection capabilities to shorten timelines and improve confidence levels in reporting to national level decision makers. - Address lessons learned from the first Post-Detonation NTNF Pathfinder exercise and findings identified by the National Academy of Sciences. - Educate Military & Federal workforce in areas critical to the Stockpile Stewardship Program and to increase understanding of the history of nuclear weapons development, testing, and design. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Increase in funding is associated with the elimination of the CNT program and the transition of funding from CNT to NTNF to address this critical need.			
Accomplishments/Planned Programs Subtotals	0.128	1.725	7.370

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603161D8Z / *Nuclear and Conventional Physical Security/National Technical Nuclear Forensics*	**Project (Number/Name)** 040 / *National Technical Nuclear Forensics Systems*

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0603161D8Z / *Nuclear and Conventional Physical Security/National Technical Nuclear Forensics*	Project (Number/Name) 040 / *National Technical Nuclear Forensics Systems*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
National Nuclear Technical Forensics Product Development	Various	Multiple Performers : Multiple Locations	38.681	-		-		7.175		-		7.175	Continuing	Continuing	-
AFTAC Projects	MIPR	Air Force Technical Applications Center : Patrick AFB, Florida	2.464	0.000		1.530		-		-		-	-	-	-
		Subtotal	41.145	0.000		1.530		7.175		-		7.175	Continuing	Continuing	N/A

Remarks

NA

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 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	0.804	0.128		0.195		0.195		-		0.195	Continuing	Continuing	-
		Subtotal	0.897	0.128		0.195		0.195		-		0.195	Continuing	Continuing	N/A

Remarks

NA

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	42.042	0.128		1.725		7.370		-		7.370	Continuing	Continuing	N/A

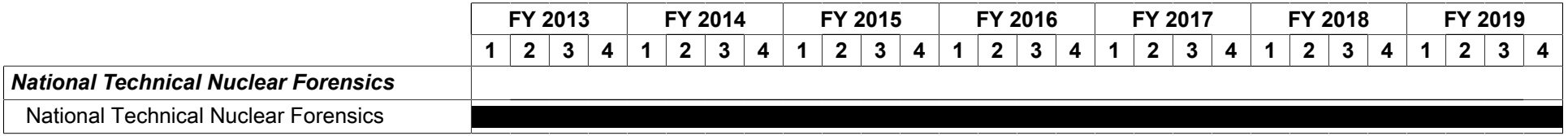
Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0603161D8Z / *Nuclear and Conventional Physical Security/National Technical Nuclear Forensics*	Project (Number/Name) 040 / *National Technical Nuclear Forensics Systems*	

	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract

Remarks

NA

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603161D8Z / *Nuclear and Conventional Physical Security/National Technical Nuclear Forensics*	**Project (Number/Name)** 040 / *National Technical Nuclear Forensics Systems*



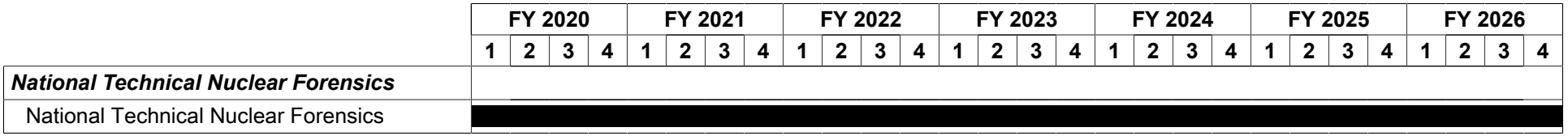


Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603161D8Z / *Nuclear and Conventional Physical Security/National Technical Nuclear Forensics*	**Project (Number/Name)** 040 / *National Technical Nuclear Forensics Systems*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
National Technical Nuclear Forensics				
National Technical Nuclear Forensics	1	2013	4	2026

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0603161D8Z / *Nuclear and Conventional Physical Security/National Technical Nuclear Forensics*	Project (Number/Name) 041 / *CNT Prevention ADC&P*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
041: *CNT Prevention ADC&P*	-	7.138	6.237	0.000	-	0.000	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Funding transferred from Countering Nuclear Threats to National Technical Nuclear Forensics, P040. This decision affects Program Elements 0603161D8Z and 0604161D8Z by eliminating the CNT program.

A. Mission Description and Budget Item Justification

Funding transferred from Countering Nuclear Threats to National Technical Nuclear Forensics, P040. This decision affects Program Elements 0603161D8Z and 0604161D8Z by eliminating the CNT program.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Countering Nuclear Threats	7.138	6.237	-
Description: Funding transferred from Countering Nuclear Threats to National Technical Nuclear Forensics, P040. This decision affects Program Elements 0603161D8Z and 0604161D8Z by eliminating the CNT program. ***FY 2021 Plans:*** - 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: - 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. - 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. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Funding transferred from Countering Nuclear Threats to National Technical Nuclear Forensics, P040. This decision affects Program Elements 0603161D8Z and 0604161D8Z by eliminating the CNT program.			
Accomplishments/Planned Programs Subtotals	7.138	6.237	-

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603161D8Z / *Nuclear and Conventional Physical Security/National Technical Nuclear Forensics*	**Project (Number/Name)** 041 / *CNT Prevention ADC&P*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603161D8Z / *Nuclear and Conventional Physical Security/National Technical Nuclear Forensics*	**Project (Number/Name)** 041 / *CNT Prevention ADC&P*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Countering Nuclear Threats	Various	Various Performers : Various Locations	-	7.138		6.237		-		-		-	Continuing	Continuing	-
		Subtotal	-	7.138		6.237		-		-		-	Continuing	Continuing	N/A

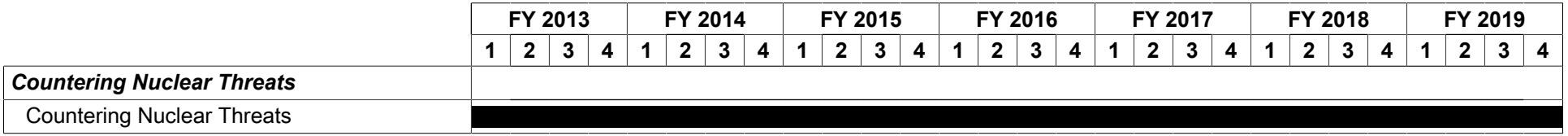
Remarks

Funding transferred from Countering Nuclear Threats to National Technical Nuclear Forensics, P040. This decision affects Program Elements 0603161D8Z and 0604161D8Z by eliminating the CNT program.

	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	7.138		6.237		-		-		-	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603161D8Z / *Nuclear and Conventional Physical Security/National Technical Nuclear Forensics*	**Project (Number/Name)** 041 / *CNT Prevention ADC&P*



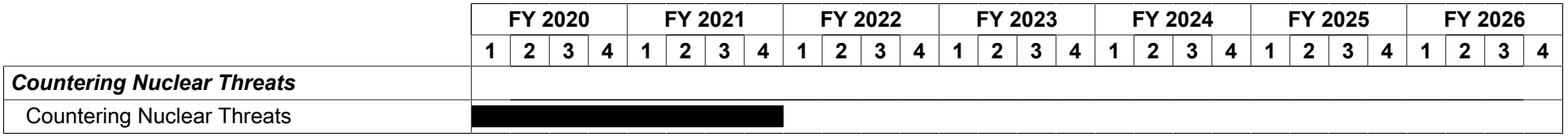


Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603161D8Z / *Nuclear and Conventional Physical Security/National Technical Nuclear Forensics*	**Project (Number/Name)** 041 / *CNT Prevention ADC&P*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Countering Nuclear Threats				
Countering Nuclear Threats	1	2013	4	2021

THIS PAGE INTENTIONALLY LEFT BLANK

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603600D8Z / *WALKOFF*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	89.374	90.404	101.529	108.652	-	108.652	-	-	-	-	-	-
600: *WALKOFF*	89.374	90.404	101.529	108.652	-	108.652	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

Classified

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	92.791	106.529	108.652	-	108.652
Current President's Budget	90.404	101.529	108.652	-	108.652
Total Adjustments	-2.387	-5.000	0.000	-	0.000
• Congressional General Reductions	-	-5.000			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-2.387	-			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0603600D8Z / *WALKOFF*	Project (Number/Name) 600 / *WALKOFF*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
600: *WALKOFF*	89.374	90.404	101.529	108.652	-	108.652	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Classified.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: WALKOFF	90.404	101.529	108.652
Description: Classified. ***FY 2021 Plans:*** Classified ***FY 2022 Plans:*** Classified ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Classified.			
Accomplishments/Planned Programs Subtotals	90.404	101.529	108.652

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
• 0603600D8Z O&M DW: *WALKOFF*	3.975	4.233	4.267	-	4.267	-	-	-	-	-	-

Remarks

D. Acquisition Strategy

Classified.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603600D8Z / *WALKOFF*	**Project (Number/Name)** 600 / *WALKOFF*

Remarks

Classified.

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603600D8Z / *WALKOFF*	**Project (Number/Name)** 600 / *WALKOFF*

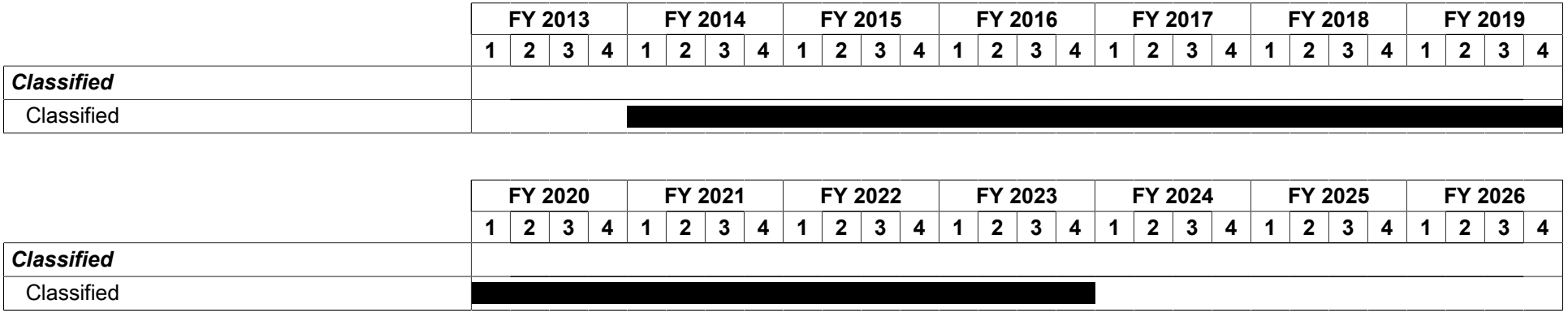


Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603600D8Z / *WALKOFF*	**Project (Number/Name)** 600 / *WALKOFF*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Classified				
Classified	1	2014	4	2023

THIS PAGE INTENTIONALLY LEFT BLANK

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603821D8Z / *Acquisition Enterprise Data & Information Services*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	6.455	5.293	0.000	0.000	-	0.000	-	-	-	-	-	-
840: *Acquisition Enterprise Data & Information Services*	6.455	5.293	0.000	0.000	-	0.000	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Beginning FY 2021 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 supported 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. FY 2021 - FY 2025 funding was transferred to BA 8, PE 0608648D8Z, in support of the Software and Digital Technology Pilot Program.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	5.659	0.000	0.000	-	0.000
Current President's Budget	5.293	0.000	0.000	-	0.000
Total Adjustments	-0.366	0.000	0.000	-	0.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-0.159	-			
• SBIR/STTR Transfer	-0.207	-			

Change Summary Explanation

Beginning FY 2021 funding was transferred to BA 8, PE 0608648D8Z, in support of the Software and Digital Technology Pilot Program.

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Acquisition Enterprise Data & Information Services	5.293	0.000	0.000

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603821D8Z *I Acquisition Enterprise Data & Information Services*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Description: Acquisition Enterprise Data & Information Services investments enhanced the visibility of the Department's acquisition programs for the DAE, CAEs, Service Chiefs of Staff, OSD senior leaders, and OSD and Component analysts. Delivered Content Management, SIPR, Acquisition Program Baseline (APB) Increment 1 in FY 2020. ***FY 2021 Plans:*** No FY 2021 Plans. Program has been transferred to BA 8, PE 0608648D8Z, Acquisition Visibility, a Software and Digital Technology Pilot Program. Plans are noted under that Program Element. ***FY 2022 Plans:*** No FY 2022 Base Plans. Program has been transferred to BA 8, PE 0608648D8Z, Acquisition Visibility, a Software and Digital Technology Pilot Program. Plans are noted under that Program Element.			
Accomplishments/Planned Programs Subtotals	5.293	0.000	0.000

D. Other Program Funding Summary ($ in Millions)

N/A

Remarks

E. Acquisition Strategy

Development and prototyping acquired through a combination of competed small-disadvantaged business and small business contracts.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603821D8Z / *Acquisition Enterprise Data & Information Services*	**Project (Number/Name)** 840 / *Acquisition Enterprise Data & Information Services*

Remarks

NA

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603821D8Z / *Acquisition Enterprise Data & Information Services*	**Project (Number/Name)** 840 / *Acquisition Enterprise Data & Information Services*

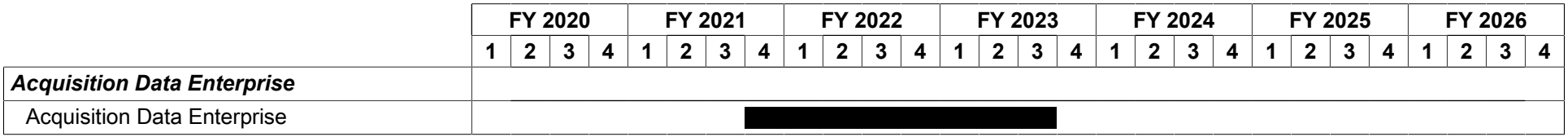


Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603821D8Z / *Acquisition Enterprise Data & Information Services*	**Project (Number/Name)** 840 / *Acquisition Enterprise Data & Information Services*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Acquisition Data Enterprise				
Acquisition Data Enterprise	4	2021	3	2023

THIS PAGE INTENTIONALLY LEFT BLANK

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603851D8Z / *Environmental Security Technology Certification Program (ESTCP)*

COST ($ in Millions)	Prior Years (+)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	461.244	65.016	73.307	71.429	-	71.429	-	-	-	-	-	-
514: *Environmental Security Technology Certification Program*	455.244	65.016	73.307	71.429	-	71.429	-	-	-	-	-	-

(+) 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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	68.572	61.345	57.178	-	57.178
Current President's Budget	65.016	73.307	71.429	-	71.429
Total Adjustments	-3.556	11.962	14.251	-	14.251
• Congressional General Reductions	-	-0.038			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	2.000	12.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-2.503	-			
• Program Adjustments	-3.053	-	-	-	-
• Climate Adaptation Enhancements	-	-	14.251	-	14.251

Change Summary Explanation

The Congressional adds in FY 2021 are for Aqueous Film Forming Foam (AFFF) alternatives shore-based aircraft, PFAS remediation and disposal technology, and sustainable technologies evaluation and demonstration program.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603851D8Z *I Environmental Security Technology Certification Program (ESTCP)*

Realigned funds to meet National Defense Strategy priorities.

Increase in FY2022 is for climate adaptation enhancements.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0603851D8Z / *Environmental Security Technology Certification Program (ESTCP)*	Project (Number/Name) 514 / *Environmental Security Technology Certification Program*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
514: *Environmental Security Technology Certification Program*	455.244	65.016	73.307	71.429	-	71.429	-	-	-	-	-	-
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 2020	FY 2021	FY 2022
Title: Environmental Technology Demonstration/Validation	35.670	48.922	31.532

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 2021 Plans:

Transition of additional projects focused on detection, quantification and remediation of per- and polyfluorinated alkyl substances (PFAS) from Strategic Environmental Research and Development Program (SERDP) development, complete two large-scale demonstrations of low-frequency 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 Aqueous Film Forming Foam (AFFF) as new agents are developed in SERDP.

FY 2022 Plans:

Completion of data collection to support development of a new Military Specification (MILSPEC) for shore-side fire extinguishment foams for DoD use. Completion of technology demonstration to clean firefighting trucks and hangar systems in anticipation of the change-over to PFAS-free foams as required by FY 2020 NDAA. Completion of projects examine the impact of multiple stressors to marine mammals.

FY 2021 to FY 2022 Increase/Decrease Statement:

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603851D8Z / *Environmental Security Technology Certification Program (ESTCP)*	**Project (Number/Name)** 514 / *Environmental Security Technology Certification Program*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
FY 2021 to FY 2022 decrease due to realignment to projects focusing on climate sustainability of installation energy and water systems.			
Title: Energy Technology Demonstration/Validation	27.346	21.385	39.897
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. ***FY 2021 Plans:*** 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. ***FY 2022 Plans:*** Completion of energy storage demonstrations within DoD microgrids as one component of increased installation energy resilience. Broadening of the energy efficiency technology demonstrations integrated with UESC to wider variety of Utility Services Companies as a way to facilitate tech transfer of previously-demonstrated energy technologies into wide adoption. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2021 to FY 2022 increase will be used for additional projects focusing on climate sustainability of installation infrastructure.			
Title: Sustainable Technologies Evaluation and Demonstration Program	2.000	3.000	0.000
Description: Congressionally mandated Evaluation and Demonstration Program ***FY 2021 Plans:*** None ***FY 2022 Plans:***			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603851D8Z / *Environmental Security Technology Certification Program (ESTCP)*	**Project (Number/Name)** 514 / *Environmental Security Technology Certification Program*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
None ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Program ends in FY 2022.			
Accomplishments/Planned Programs Subtotals	65.016	73.307	71.429

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 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603851D8Z / *Environmental Security Technology Certification Program (ESTCP)*	**Project (Number/Name)** 514 / *Environmental Security Technology Certification Program*

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Support Contract	C/IDDQ	Noblis : Reston, VA	22.731	2.940	Jan 2019	2.940	Jan 2019	2.940		-		2.940	-	-	19.650
		Subtotal	22.731	2.940		2.940		2.940		-		2.940	-	-	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Installation Energy and Water	C/Various	Various : Various	188.528	25.174		26.128		38.280		-		38.280	-	-	-
Weapons Systems and Platforms	C/Various	Various : Various	70.088	9.337		9.697		8.507		-		8.507	-	-	-
Munitions Response	C/Various	Various : Various	47.825	8.584		5.359		4.908		-		4.908	-	-	-
Environmental Restoration	C/Various	Various : Various	82.966	10.823		21.844		8.943		-		8.943	-	-	-
Resource Conservation and Resiliency	C/Various	Various : Various	43.106	6.158		4.339		7.851		-		7.851	-	-	-
Sustainable Technologies Evaluation and Demonstration Program	C/Various	Various : Various	-	2.000		3.000		0.000		-		0.000	-	-	-
		Subtotal	432.513	62.076		70.367		68.489		-		68.489	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	455.244	65.016		73.307		71.429		-		71.429	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603851D8Z / *Environmental Security Technology Certification Program (ESTCP)*	**Project (Number/Name)** 514 / *Environmental Security Technology Certification Program*

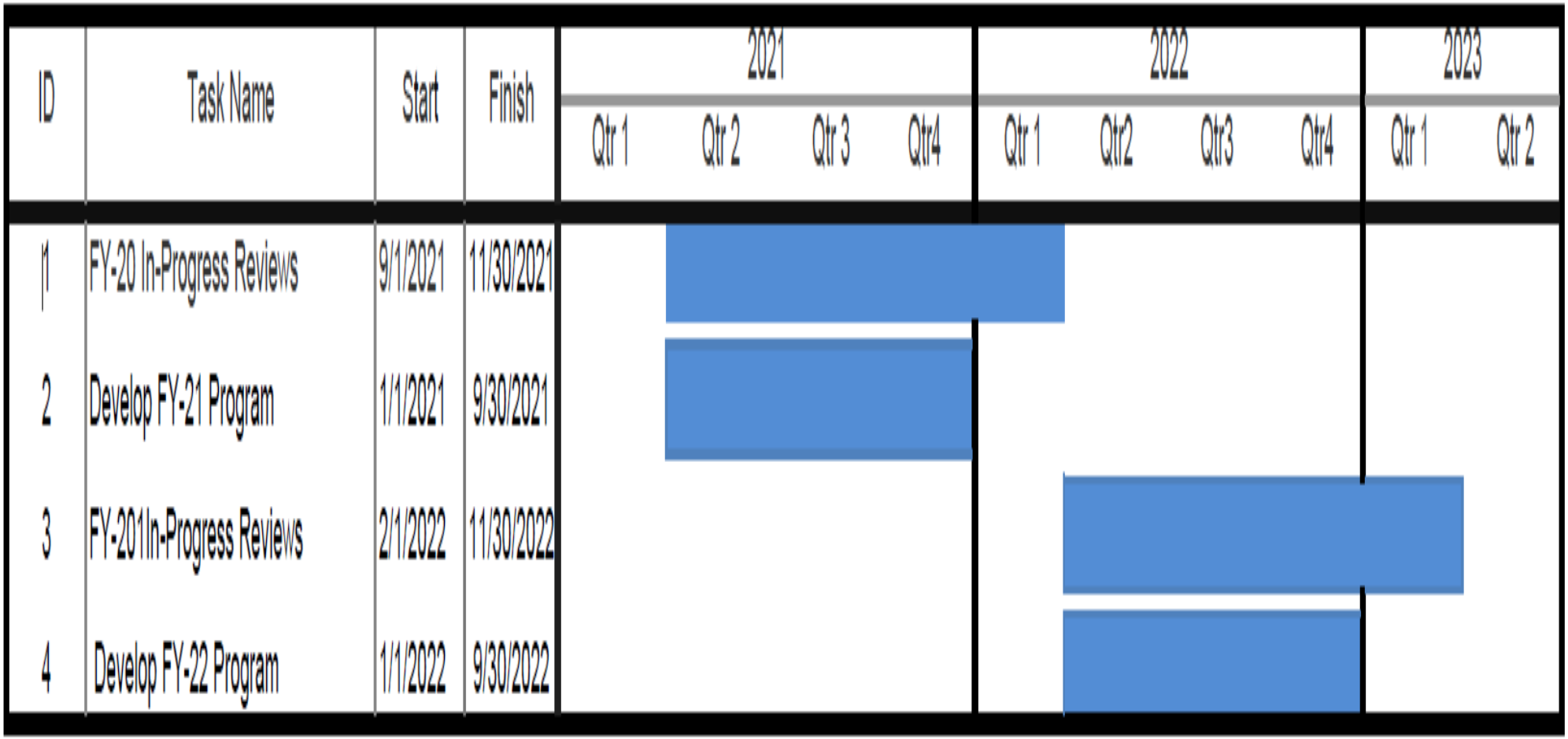


Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603851D8Z / *Environmental Security Technology Certification Program (ESTCP)*	**Project (Number/Name)** 514 / *Environmental Security Technology Certification Program*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
In Progress Reviews				
FY 2019 In Progress Reviews	2	2020	1	2021
FY 2020 In Progress Reviews	2	2021	1	2022
Develop Program				
Develop FY 2020 Program	2	2020	4	2020
Develop FY 2021 Program	2	2021	4	2021

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603920D8Z / *Humanitarian De-mining*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	88.675	14.294	0.000	0.000	-	0.000	-	-	-	-	-	-
920: *Humanitarian De-mining*	88.675	14.294	0.000	0.000	-	0.000	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

The Humanitarian De-mining program was transferred to the Department of the Army beginning FY 2021. The program 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.

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 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603920D8Z / *Humanitarian De-mining*

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	14.700	0.000	0.000	-	0.000
Current President's Budget	14.294	0.000	0.000	-	0.000
Total Adjustments	-0.406	0.000	0.000	-	0.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Program Adjustment	-0.406	-	-	-	-

Change Summary Explanation

The Humanitarian De-mining program was transferred to the Department of the Army beginning FY 2021.

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: SO/LIC Humanitarian De-mining	14.294	0.000	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 2021 Plans:*** The program transferred to the Army. ***FY 2022 Plans:*** N/A ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The Humanitarian De-mining program was transferred to the Department of the Army beginning FY 2021.			
Accomplishments/Planned Programs Subtotals	14.294	0.000	0.000

D. Other Program Funding Summary ($ in Millions)

N/A

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603920D8Z / *Humanitarian De-mining*

D. Other Program Funding Summary ($ in Millions)

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 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603920D8Z / *Humanitarian De-mining*	**Project (Number/Name)** 920 / *Humanitarian De-mining*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Primary Hardware Development	Various	RDECOM-NVESD : Ft Belvoir, VA	49.089	7.533		0.000		-		-		-	-	-	-
		Subtotal	49.089	7.533		0.000		-		-		-	-	-	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 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Humanitarian Demining Research and Development Program	Various	RDECOM-NVESD : Ft Belvoir, VA	37.041	6.489		0.000		-		-		-	-	-	-
		Subtotal	37.041	6.489		0.000		-		-		-	-	-	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 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Humanitarian Demining Program Management Support	Various	RDECOM-NVESD : Ft Belvoir, VA	2.545	0.272		0.000		-		-		-	-	-	-
		Subtotal	2.545	0.272		0.000		-		-		-	-	-	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 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603920D8Z / *Humanitarian De-mining*	**Project (Number/Name)** 920 / *Humanitarian De-mining*

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 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 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	88.675	14.294		0.000		-		-		-	-	-	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 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603920D8Z / *Humanitarian De-mining*	**Project (Number/Name)** 920 / *Humanitarian De-mining*

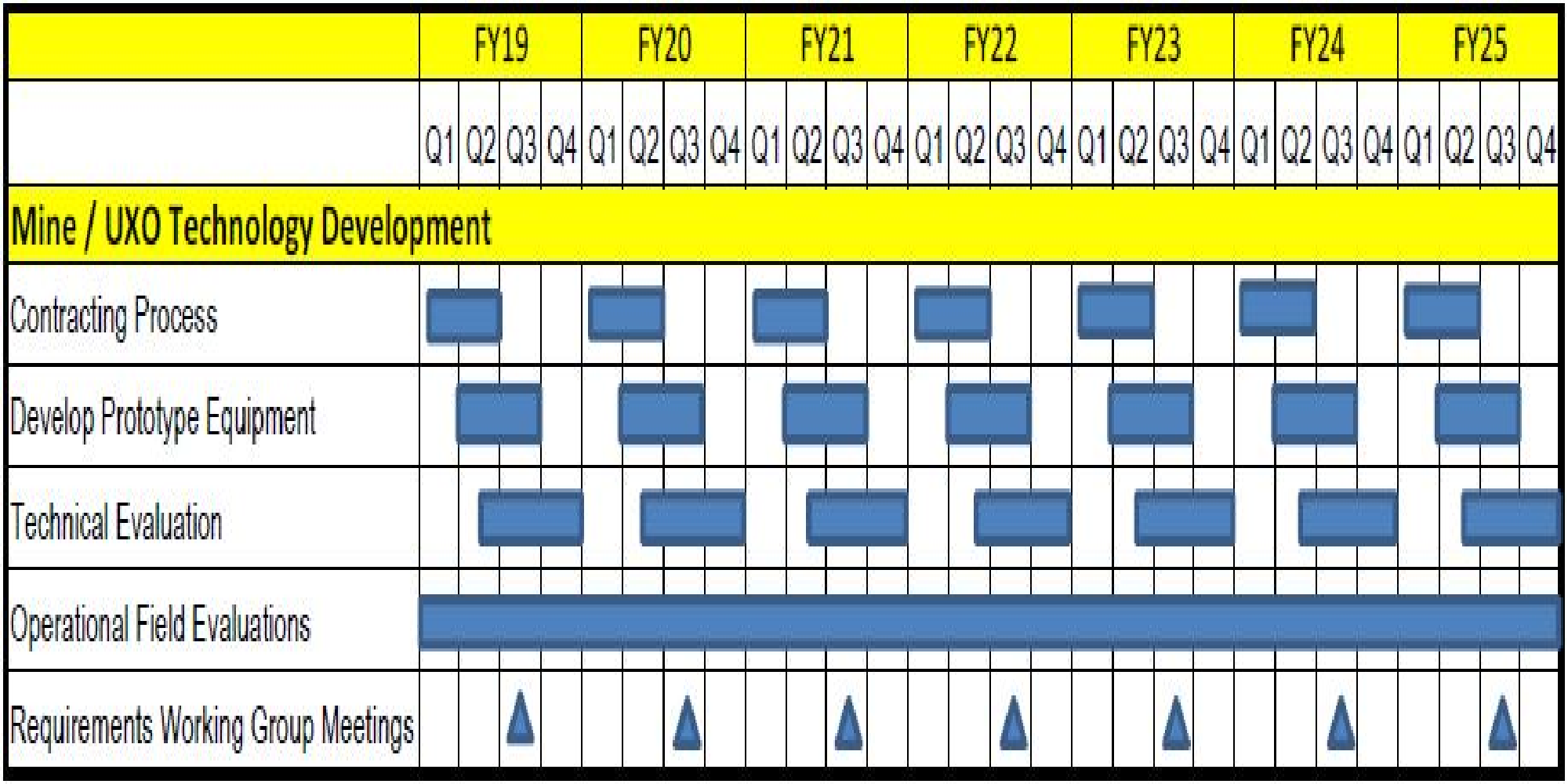


Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603920D8Z / *Humanitarian De-mining*	**Project (Number/Name)** 920 / *Humanitarian De-mining*

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

THIS PAGE INTENTIONALLY LEFT BLANK

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603923D8Z / *Coalition Warfare Program (CWP)*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	81.129	11.159	10.123	5.103	-	5.103	-	-	-	-	-	-
923: *Coalition Warfare*	81.129	11.159	10.123	5.103	-	5.103	-	-	-	-	-	-

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. It 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 accelerates the development and delivery of technical solutions to the warfighter. For every $1 CWP has invested in cooperative projects with 76 partners since 2001, the program has leveraged $3 in foreign partner resources and $2 in other U.S. Government resources; providing an overall 5:1 return on investment. CWP funding enables DoD project teams to transition technology to operational use, further development, or integration into other systems. These projects may also form the basis for future cooperation with international partners.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	11.316	10.129	9.491	-	9.491
Current President's Budget	11.159	10.123	5.103	-	5.103
Total Adjustments	-0.157	-0.006	-4.388	-	-4.388
• Congressional General Reductions	-	-0.006			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.155	-			
• Program Adjustments	-0.002	-	-4.388	-	-4.388

Change Summary Explanation

The FY 2022 funding request was reduced by $4.107 million to account for the availability of prior year execution balances.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0603923D8Z / *Coalition Warfare Program (CWP)*	Project (Number/Name) 923 / *Coalition Warfare*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
923: *Coalition Warfare*	81.129	11.159	10.123	5.103	-	5.103	-	-	-	-	-	-
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. It 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 multi-national 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 accelerates the development and delivery of technical solutions to the warfighter. For every $1 CWP has invested in cooperative projects with 76 partners since 2001, the program has leveraged $3 in foreign partner resources and $2 in other U.S. Government resources; providing an overall 5:1 return on investment. CWP funding enables DoD project teams to transition technology to operational use, further development, or integration into other systems. These projects may also form the basis for future cooperation with international partners.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Coalition Warfare Program (Continuing Projects)	11.159	10.123	5.103
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 and future defense partnerships. CWP selects projects for funding through an annual competitive selection process in accordance with Department of Defense and Combatant Command needs. 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 governed by negotiated/signed international agreements with 19 different foreign partners. Including prior year project selections, the following FY 2021 projects encompass CWP funding in FY 2021 and FY 2022:			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603923D8Z / *Coalition Warfare Program (CWP)*	**Project (Number/Name)** 923 / *Coalition Warfare*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
• Collaborative Artificial Intelligence (AI) at the Tactical Edge (CATE) (US Army) • Air-launched Unmanned Aerial System (UAS) for Extended-range Communications (ALAUS) (US Air Force) • Diagnostic Applied to Heterogeneous Multi-phase Reactive Blast (HMRB) (DTRA) • High Speed Sensors, Materials, Airframes, and Controls (HSMAC) (US Air Force) • Integrated Threat Awareness - Coalition (ITAC) (US Army) • Low-Light Automated Identification System for Maritime Domain Awareness (LLAMDA) (US Navy) • Stealth Ultra Low-Power Underwater Sensors (LPS) (US Navy) • Lightweight Transparent Armor (LWTA) (US Navy) • A Review of Surface Analysis Technologies for Increasing Robustness of Composite Bonding in the Fleet (SAT-IRCB) (US Navy) • Manufacturing Alloys for Near-Net Turbine Applications to Supersonic (MANTAS) (US Air Force) • Synthetic Environment Enhanced Artificial Intelligence (AI) for Wargaming, Course of Action Analysis, Decision Making, and Training (WARGAMING) (US Army) 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 2021 Plans:*** Completion of efforts that will develop coalition interoperable, undersea power and data stations (uPODS) that can autonomously transfer wireless energy/data to undersea vehicles (UUV's) (uPODS); develop and demonstrate radar, munition, and launcher technologies with the ability to detect, track, and defeat of Low, Slow, Small (LSS) Unmanned Aerial Systems (UASs)(AERIAL THREAT DEFEAT); advance methods for space object understanding of Resident Space Objects (RSOs) better enabling collaborative coalition Space Situational Awareness (SSA) and Command and Control (C2) (ALLIANCE); improve the non-lethal weapon effective range of high-powered radio frequency vessel/vehicle stopping systems, using recent developments in vacuum electronics designs (RF tubes) and solid state power modulators (HIPOM); measure signatures of non-cooperative maritime traffic and perform automated detection at range using hyperspectral imagery, yielding 2.5X-10X better performance than traditional visible cameras (SHIP DETECTION); provide autonomous ground refueling capability for rotary-wing aircraft in remote and rugged terrain using fast fuel transfer and self- surveillance capability (AR3P); develop a revolutionary micro-layer transparent armor that uses the new, emerging Naval Research Laboratory ballistic shockwave re-direction and attenuation concept, recently demonstrated, to obtain a 2x reduction in transparent armor weight (Micro Layered Transparent Armor - MLTA); develop and test compact wide-band IR imaging lens systems with bonded glass elements to reduce SWaP-C (size, weight, power and cost) of imaging sensors on weight-sensitive platforms for all services (CIRIS); develop and validate a new class of			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603923D8Z / *Coalition Warfare Program (CWP)*	**Project (Number/Name)** 923 / *Coalition Warfare*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
multirole 5000 series aluminum-magnesium alloys for improved welded strength, ballistics, and marine corrosion resistance to replace current alloy 5083 in ground, amphibious, and sea systems (AL MGS ALLOYS); develop and test antireflective (AR) moth eye surfaces fabricated on optics and detectors to enable low reflections and resistance to laser damage without use of traditional AR coatings (MOTH EYE); develop surface and subsurface sediment/beach characterization tools using hyperspectral and multi-band synthetic aperture radar in maritime environments (Remote Multi-sensor Multi-angular Terrain Characterization - MSTC); develop a methodology and the software tools necessary to rapidly integrate Information, Surveillance, Target Acquisition, and Reconnaissance (ISTAR) sensors and validate interoperability of these sensors with US and partner sensor architectures (RAPID INTEGRATION); develop Arctic high frequency (HF) surveillance capabilities with supporting long-haul HF communications (ARCTIC HF SURVEILLANCE); and develop and deliver new bomb crater repair solutions for rapidly repairing craters for roads and airfields in extreme cold weather conditions (CRADR). ***FY 2022 Plans:*** Completion of efforts that will Improve Coalition exploitation of WMD Underground facilities with robotics collaboration and progressive demonstrations (ATE); develop and assess a low light level, digital fused goggle with augmented reality for enhanced Soldier mobility (DELTA-I); develop and demonstrate prototype of terrestrial free-space laser communication network system for critical military uninterrupted communication and information links (LASERCOMMNET); build, fly, and demonstrate micro-satellites with onboard Automated Identification System (AIS) and imagery-based ship detection fused to provide maritime domain awareness (MICROSAT MDA); establish the capability for space solar cell calibration to enable accurate calculation on orbit power for all military and commercial spacecraft (SOLARCELLCAL); develop and demonstrate a Solid Propellant Rotating Detonation Engine (SPEAR); develop and test revolutionary infrared (IR) refractive non-mechanical beam steering (NMBS) devices using operationally-relevant laser sources for low size, weight, and power (SWAP) and high speed applications (ALIS); and develop a shared, persistent, affordable and accessible distributed collaborative development and simulation test bed capability, with a repository of released data and models for reuse, connected to partner nation defense labs to facilitate rapid prototype testing and experimentation to address warfighter challenges (VIPRE). ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The FY 2022 funding request was reduced by $4.107 million to account for the availability of prior year execution balances and to support the department's other priorities, 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.			
Accomplishments/Planned Programs Subtotals	11.159	10.123	5.103

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603923D8Z / *Coalition Warfare Program (CWP)*	**Project (Number/Name)** 923 / *Coalition Warfare*

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 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603923D8Z / *Coalition Warfare Program (CWP)*	**Project (Number/Name)** 923 / *Coalition Warfare*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Coalition Warfare Program Project Product Development Costs	Various	Various : Various	58.692	9.389		8.382		3.867		-		3.867	-	-	-
		Subtotal	58.692	9.389		8.382		3.867		-		3.867	-	-	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Coalition Warfare Program Project Test and Evaluation Costs	Various	Various : Various	12.885	0.940		0.896		0.386		-		0.386	-	-	-
		Subtotal	12.885	0.940		0.896		0.386		-		0.386	-	-	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Coalition Warfare Program Project Management Services Costs	Option/ FFP	Analygence, INC. : Fulton, MD	9.552	0.830		0.845		0.850		0.000		0.850	-	-	-
		Subtotal	9.552	0.830		0.845		0.850		0.000		0.850	-	-	N/A

	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	81.129	11.159		10.123		5.103		0.000		5.103	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603923D8Z / *Coalition Warfare Program (CWP)*	**Project (Number/Name)** 923 / *Coalition Warfare*

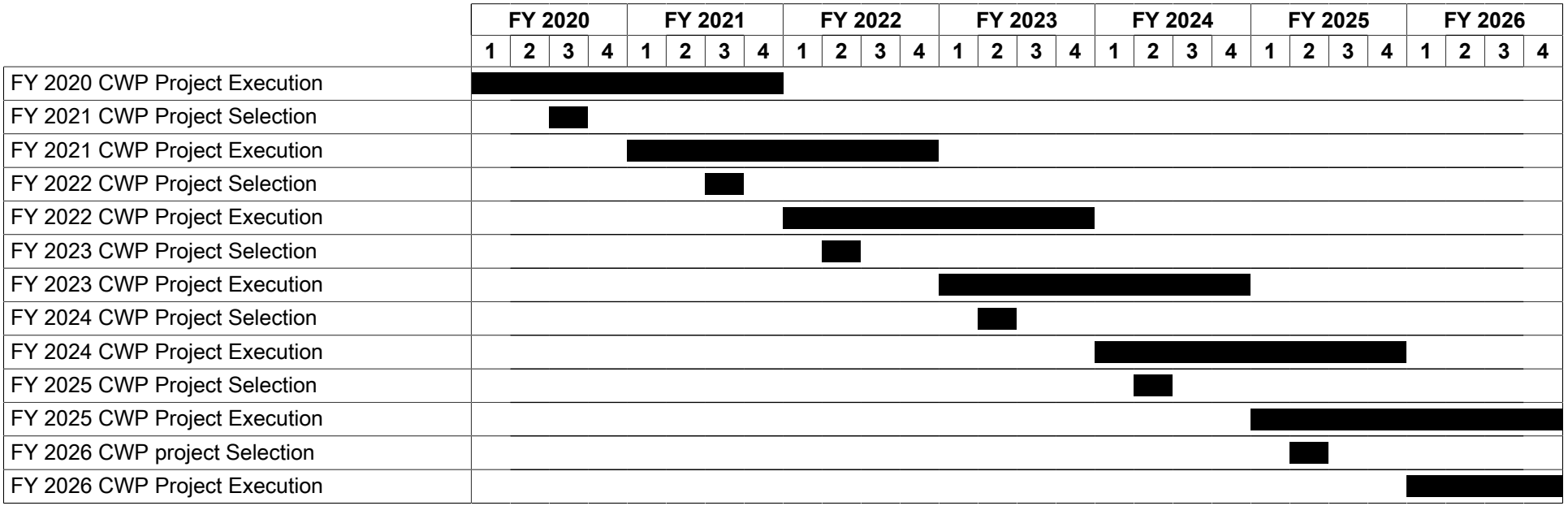


Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0603923D8Z / *Coalition Warfare Program (CWP)*	**Project (Number/Name)** 923 / *Coalition Warfare*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
FY 2020 CWP Project Execution	1	2020	4	2021
FY 2021 CWP Project Selection	3	2020	3	2020
FY 2021 CWP Project Execution	1	2021	4	2022
FY 2022 CWP Project Selection	3	2021	3	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	2026
FY 2026 CWP project Selection	2	2025	2	2025
FY 2026 CWP Project Execution	1	2026	4	2026

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604011D8Z / *Next Generation ICT (5G)*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	52.000	199.965	439.769	374.665	-	374.665	-	-	-	-	-	-
724: *Dual Use 5G Use Cases*	32.000	118.292	226.769	72.000	-	72.000	-	-	-	-	-	-
725: *Congested/Congested Spectrum*	14.000	75.581	198.000	283.665	-	283.665	-	-	-	-	-	-
726: *External Engagement*	6.000	6.092	15.000	19.000	-	19.000	-	-	-	-	-	-

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 (5G) cellular network technology for military uses. The program will develop and deploy 5G networks at DoD sites to evaluate and enhance 5G systems and technologies for CONUS and OCONUS DoD missions. This will include both the direct use of commercially available capabilities and DoD-specific technology enhancements and applications 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 untrusted networks. The program will:

• Deploy flexible 5G infrastructure at twelve or more U.S. military facilities to enable varied applications and networking prototypes,
• Evaluate at least twenty different DoD 5G applications at DoD facilities across the Services based on parallel commercial applications and technologies,
• Demonstrate the capacity to “operate through” existing commercial 5G infrastructure throughout the globe, leveraging existing infrastructure to meet DoD mission needs and learning how to utilize untrusted 5G networks through automated security techniques.

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 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604011D8Z *I Next Generation ICT (5G)*

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	200.000	449.000	376.000	-	376.000
Current President's Budget	199.965	439.769	374.665	-	374.665
Total Adjustments	-0.035	-9.231	-1.335	-	-1.335
• Congressional General Reductions	-	-19.231			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	10.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Cancelled Account	-0.035	-	-	-	-
• Program Adjustment	-	-	-1.335	-	-1.335

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2020	FY 2021
Project: 725: *Congested/Congested Spectrum*		
Congressional Add: *5G SPECTRUM Reallocation Mitigation*	-	10.000
Congressional Add Subtotals for Project: 725	-	10.000
Congressional Add Totals for all Projects	-	10.000

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604011D8Z / *Next Generation ICT (5G)*	Project (Number/Name) 724 / *Dual Use 5G Use Cases*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
724: *Dual Use 5G Use Cases*	32.000	118.292	226.769	72.000	-	72.000	-	-	-	-	-	-
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 communications, as well as augmented and virtual reality (AV/VR) technologies that enable high fidelity mission planning and training in realistic 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 2020	FY 2021	FY 2022
Title: Dual Use 5G Use Cases	118.292	226.769	72.000
Description: Demonstrate use cases of both commercial and military value, while also assessing and developing mitigations to their security vulnerabilities.			
FY 2021 Plans: DoD will continue Smart Warehouse prototyping and experimentation activities at Marine Corps Logistics Base Albany (MCLBA), and Naval Base San Diego (NBSD); and will continue AR/VR Mission Training prototyping and experimentation activities at Joint Base Lewis-McChord (JBLM). Construction of localized full scale 5G mobile cellular networks will be expanded and interfaced with other networks as needed to conduct further development and experimentation of autonomous warehouse operations and AR/VR mission training activities.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604011D8Z / *Next Generation ICT (5G)*	**Project (Number/Name)** 724 / *Dual Use 5G Use Cases*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
DoD will initiate approximately five additional dual-use prototyping and experimentation projects at DoD Service-designated sites. Localized full scale 5G mobile cellular networks will be designed and constructed in order to support the dual-use military application experimentation at the designated DoD sites. ***FY 2022 Plans:*** DoD will continue Smart Warehouse prototyping and experimentation activities at MCLBA, 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 completed and experimentation with autonomous warehouse operations and AR/VR mission training activities will be conducted. DoD will continue with the development of approximately five additional dual-use prototyping and experimentation projects at Joint Base Pearl Harbor - Hickam, Naval Station Norfolk, Camp Pendleton, the National Training Center, and Joint Base San Antonio. Localized full scale 5G mobile cellular networks will be designed and initially constructed in order to support the dual-use military application experimentation at these DoD Service sites. The additional sites will experiment with AR/VR for aircraft readiness, ship-wide and pier-side connectivity, rapidly deployable 5G for tactical command and control centers, and AR/VR for medical applications to include training. DoD will initiate additional experiments at existing DoD Service sites and initiate approximately three additional sites for dual use prototyping and experimentation projects. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Level of effort decreases between FY 2021 and FY 2022 due to the DoD experimentation sites having been constructed in FY 2020 and FY 2021, with experimentation continuing in FY 2022.			
Accomplishments/Planned Programs Subtotals	118.292	226.769	72.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604011D8Z / *Next Generation ICT (5G)*	Project (Number/Name) 724 / *Dual Use 5G Use Cases*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 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	118.292	Jun 2020	226.769	Mar 2021	72.000	Jun 2022	-		72.000	Continuing	Continuing	-
		Subtotal	32.000	118.292		226.769		72.000		-		72.000	Continuing	Continuing	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	32.000	118.292		226.769		72.000		-		72.000	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604011D8Z / *Next Generation ICT (5G)*	**Project (Number/Name)** 724 / *Dual Use 5G Use Cases*

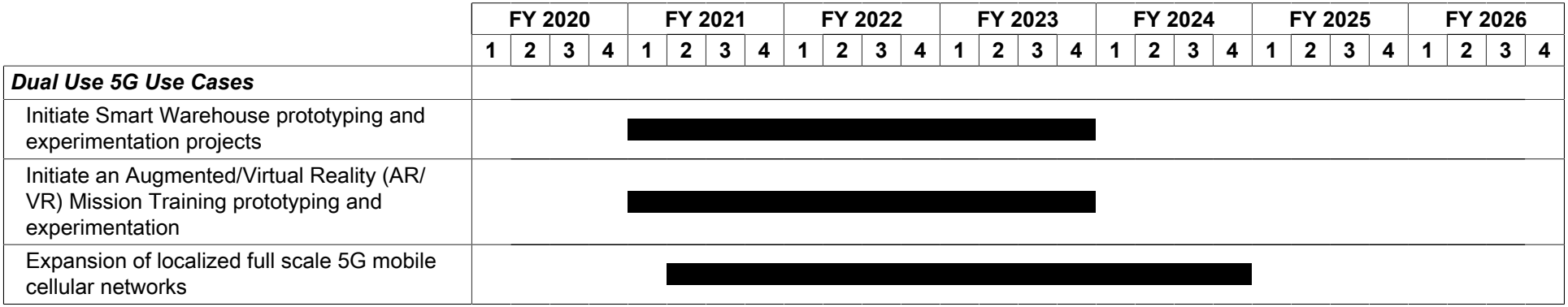


Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604011D8Z / *Next Generation ICT (5G)*	**Project (Number/Name)** 724 / *Dual Use 5G Use Cases*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Dual Use 5G Use Cases				
Initiate Smart Warehouse prototyping and experimentation projects	1	2021	4	2023
Initiate an Augmented/Virtual Reality (AR/VR) Mission Training prototyping and experimentation	1	2021	4	2023
Expansion of localized full scale 5G mobile cellular networks	2	2021	4	2024

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604011D8Z / *Next Generation ICT (5G)*	Project (Number/Name) 725 / *Congested/Congested Spectrum*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
725: *Congested/Congested Spectrum*	14.000	75.581	198.000	283.665	-	283.665	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Demonstrate the capacity to “operate through” existing commercial 5G infrastructure throughout the globe, leveraging existing infrastructure to meet DoD mission needs using dynamic spectrum utilization and controlled manipulation of 5G network security architectures. These capabilities will be based on technologies such as dynamic spectrum utilization to maximize availability and resilience for wireless connectivity, multi-networking across wired and wireless systems for finding and exploiting alternate paths and redundant paths to ensure secure and reliable communication, network monitoring including new artificial intelligence (AI) techniques that use both passive and active measurements to assess security threats and identify potential mitigations. Develop tactical, operational, and strategic networking prototypes to demonstrate capabilities to dynamically balance use of congested spectrum between military systems and commercial wireless networks.

Capabilities will be prototyped and evaluated at-scale within highly dynamic and contested radio frequency (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 2020	FY 2021	FY 2022
Title: Congested/Contested Spectrum	75.581	188.000	283.665
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. ***FY 2021 Plans:*** Continue congested/contested spectrum prototyping and experimentation activities at Hill AFB. 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 radar systems and the radar’s impact on the 5G network, employing both active and passive techniques to enable co-use or coexistence. Continue development of a network to disaggregate and mobilize command and control architectures at Nellis AFB, to include the development of 5G infrastructure with dispersed command and control nodes. Initiate approximately two additional congested/contested spectrum prototyping and experimentation projects at Tinker AFB, and a 5G Core security project centered at Joint Base San Antonio. Localized full scale 5G mobile cellular networks will be designed and initially constructed in order to evaluate the specific technologies.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604011D8Z / *Next Generation ICT (5G)*	**Project (Number/Name)** 725 / *Congested/Congested Spectrum*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Continue investments in key technologies for use in contested environments, such as: resilient networking protocols, trusted edge devices, cognitive gateways, homomorphic encryption, and secure 5G ASICs. ***FY 2022 Plans:*** Continue congested/contested spectrum prototyping and experimentation activities at Hill AFB. Continue the evaluation of the impact of the 5G network on the airborne radar systems and the radar's impact on the 5G network to enable co-use or coexistence. Continue development of a network to disaggregate and mobilize command and control architectures at Nellis AFB, to include experimentation with 5G-enabled disaggregated command and control capabilities. DoD will continue congested/contested spectrum prototyping and experimentation at Tinker AFB, and experimentation with 5G Core security and interoperability in the project centered at Joint Base San Antonio. DoD will continue investments in key technologies for use in contested environments, to enable "operating through" adversary impediments on 5G networks. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Level of effort increases between FY 2021 and FY 2022 due to the addition of new DoD experimentation sites.			
Accomplishments/Planned Programs Subtotals	75.581	188.000	283.665

	FY 2020	FY 2021
Congressional Add: 5G SPECTRUM Reallocation Mitigation	-	10.000
FY 2021 Plans: DoD will expand investments in the evaluation of midband spectrum reallocation and associated impact mitigation requirements.		
Congressional Adds Subtotals	-	10.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604011D8Z / *Next Generation ICT (5G)*	Project (Number/Name) 725 / *Congested/Congested Spectrum*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 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	75.581	Mar 2020	198.000	Mar 2021	283.665	Mar 2022	-		283.665	Continuing	Continuing	-
		Subtotal	14.000	75.581		198.000		283.665		-		283.665	Continuing	Continuing	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	14.000	75.581		198.000		283.665		-		283.665	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604011D8Z / *Next Generation ICT (5G)*	**Project (Number/Name)** 725 / *Congested/Congested Spectrum*

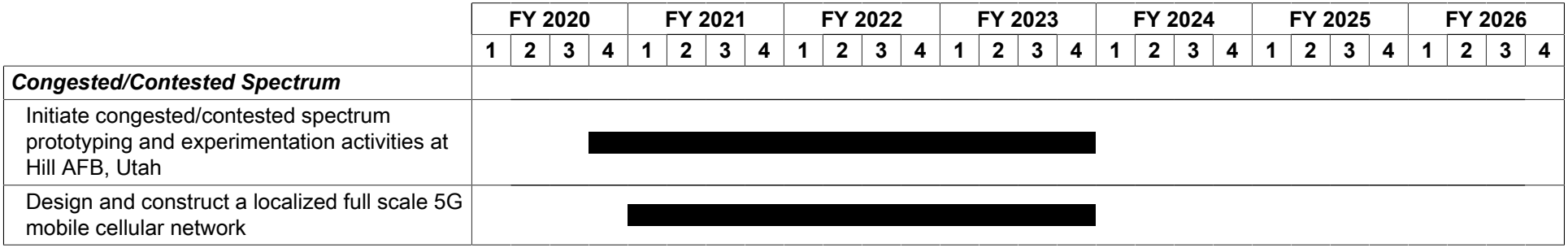


Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604011D8Z / *Next Generation ICT (5G)*	**Project (Number/Name)** 725 / *Congested/Congested Spectrum*

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	4	2020	4	2023
Design and construct a localized full scale 5G mobile cellular network	1	2021	4	2023

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604011D8Z / *Next Generation ICT (5G)*	Project (Number/Name) 726 / *External Engagement*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
726: *External Engagement*	6.000	6.092	15.000	19.000	-	19.000	-	-	-	-	-	-
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 2020	FY 2021	FY 2022
Title: External Engagement	6.092	15.000	19.000
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. ***FY 2021 Plans:*** 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. In collaboration at least one international partner, DoD will develop an initial roadmap for operating on 5G networks in coalition countries. ***FY 2022 Plans:*** 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 and coalition partnership efforts during FY 2022. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Level of effort increases between FY 2021 and FY 2022 due to the addition of new DoD experimentation sites.			
Accomplishments/Planned Programs Subtotals	6.092	15.000	19.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604011D8Z / *Next Generation ICT (5G)*	Project (Number/Name) 726 / *External Engagement*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
External Engagement	MIPR	Army, Navy, Air Force, Marine Corps, etc. : Various	6.000	6.092	Mar 2020	15.000	Mar 2021	19.000	Mar 2022	-		19.000	Continuing	Continuing	-
		Subtotal	6.000	6.092		15.000		19.000		-		19.000	Continuing	Continuing	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	6.000	6.092		15.000		19.000		-		19.000	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604011D8Z / *Next Generation ICT (5G)*	**Project (Number/Name)** 726 / *External Engagement*

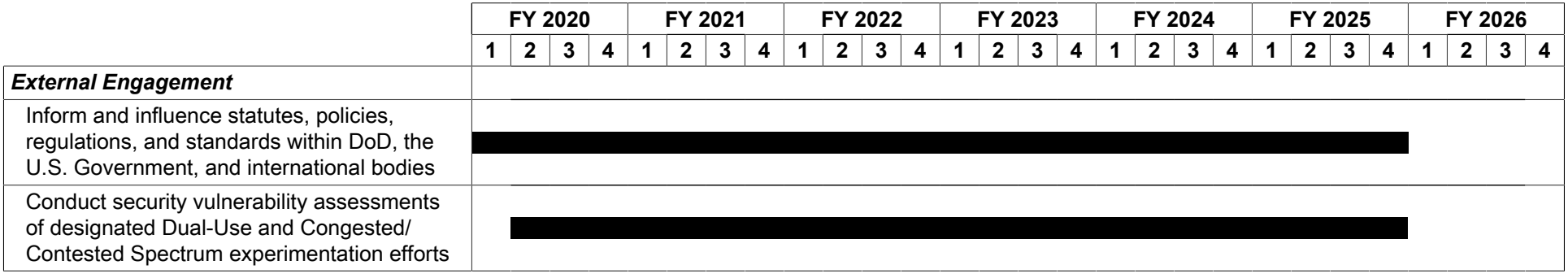


Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604011D8Z / *Next Generation ICT (5G)*	**Project (Number/Name)** 726 / *External Engagement*

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 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604016D8Z / *Department of Defense Corrosion Program*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	132.275	13.032	5.323	3.259	-	3.259	-	-	-	-	-	-
015: *Corrosion Protection Projects*	132.275	13.032	5.323	3.259	-	3.259	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

The Department of Defense (DoD) initiated the Corrosion Program in 2003 in response to 10 U.S.C. 2228, which requires the Secretary of Defense to accomplish a number of actions including the implementation of a corrosion prevention/mitigation strategic plan for DoD equipment and infrastructure. The DoD Corrosion Prevention and Control Strategy was revised and signed in January 2021.

Corrosion is a significant contributor to maintenance costs for DoD equipment and facilities. The average annual cost of corrosion by Service and Major Weapon System Platform between 2004 and 2019 was greater than $16 billion, and between 16% and 25% of all maintenance costs are attributable to corrosion, depending on the type of system. Corrosion is also a direct contributor to reduced system availability.

The DoD Corrosion Program takes a comprehensive approach to reducing these impacts through the implementation of a long-term DoD Corrosion Prevention and Control Strategy. The overall strategic goal is to demonstrate the ability to improve military readiness through the implementation of targeted and effective material and nonmaterial solutions that reduce the corrosion impacts on availability and affordability of DoD weapon systems and infrastructure. The goal can be achieved through the implementation of changes or solutions in one or more of the following focus areas: accountability; technology development and transition; policy; updated specifications and standards; and workforce development and outreach.

To implement the DoD Corrosion Strategy, the DoD Corrosion Program focuses efforts into two categories: Activities and Technology Development and Implementation. Technology development and implementation includes demonstrating and validating mature technologies and advanced research on technologies aimed at reducing cost and increasing availability of DoD weapon systems and facilities.

Demonstration/validation projects are specific corrosion prevention/mitigation efforts funded by the CPO in the Office of the Secretary of Defense (OSD) with the objective of developing, testing, qualifying, and implementing new technologies. 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.

Advanced research includes Test and Evaluation projects, research studies, and research performed by academic institutions to include the Armed Forces' Academies. The primary objectives are: (1) generate products that contribute to the scientific understanding of material degradation and protection mechanisms, (2) explore the feasibility of technologies or processes for future demonstration/implementation projects, (3) generate knowledge products that contribute to ability to make data-driven decisions to prioritize corrosion prevention investments. Research areas include:

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604016D8Z / *Department of Defense Corrosion Program*

- Improved and validated data analytics and predictive modeling
- Accelerated corrosion test method development
- Improved surface treatments and coatings
- New materials and materials processing techniques

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	13.165	3.325	3.373	-	3.373
Current President's Budget	13.032	5.323	3.259	-	3.259
Total Adjustments	-0.133	1.998	-0.114	-	-0.114
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-0.002			
• Congressional Rescissions	-	-			
• Congressional Adds	-	2.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.133	-			
• Program Adjustments	-	-	-0.114	-	-0.114

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2020	FY 2021
Project: 015: *Corrosion Protection Projects*		
Congressional Add: *Coating technology and requirements development for facilities and infrastructure*	5.000	-
Congressional Add: *DoD Workforce Painter Training*	2.800	2.000
Congressional Add: *General DoD Corrosion Program Increase*	2.000	-
Congressional Add Subtotals for Project: 015	9.800	2.000
Congressional Add Totals for all Projects	9.800	2.000

Change Summary Explanation

Realigned funds to meet National Defense Strategy priorities.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense											Date: May 2021	
Appropriation/Budget Activity 0400 / 4					R-1 Program Element (Number/Name) PE 0604016D8Z / *Department of Defense Corrosion Program*				Project (Number/Name) 015 / *Corrosion Protection Projects*			
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
015: *Corrosion Protection Projects*	132.275	13.032	5.323	3.259	-	3.259	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Department of Defense (DoD) initiated the Corrosion Program in 2003 in response to 10 U.S.C. 2228, which requires the Secretary of Defense to accomplish a number of actions including the implementation of a corrosion prevention/mitigation strategic plan for DoD equipment and infrastructure. The DoD Corrosion Prevention and Control Strategy was revised and signed in January 2021.

Corrosion is a significant contributor to maintenance costs for DoD equipment and facilities. The average annual cost of corrosion by Service and Major Weapon System Platform between 2004 and 2019 was greater than $16 billion, and between 16% and 25% of all maintenance costs are attributable to corrosion, depending on the type of system. Corrosion is also a direct contributor to reduced system availability.

The DoD Corrosion Program takes a comprehensive approach to reducing these impacts through the implementation of a long-term DoD Corrosion Prevention and Control Strategy. The overall strategic goal is to demonstrate the ability to improve military readiness through the implementation of targeted and effective material and nonmaterial solutions that reduce the corrosion impacts on availability and affordability of DoD weapon systems and infrastructure. The goal can be achieved through the implementation of changes or solutions in one or more of the following focus areas: accountability; technology development and transition; policy; updated specifications and standards; and workforce development and outreach.

To implement the DoD Corrosion Strategy, the DoD Corrosion Program focuses efforts into two categories: Activities and Technology Development and Implementation. Technology development and implementation includes demonstrating and validating mature technologies and advanced research on technologies aimed at reducing cost and increasing availability of DoD weapon systems and facilities.

Demonstration/validation projects are specific corrosion prevention/mitigation efforts funded by the CPO in the Office of the Secretary of Defense (OSD) with the objective of developing, testing, qualifying, and implementing new technologies. 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.

Advanced research includes Test and Evaluation projects, research studies, and research performed by academic institutions to include the Armed Forces' Academies. The primary objectives are: (1) generate products that contribute to the scientific understanding of material degradation and protection mechanisms, (2) explore the feasibility of technologies or processes for future demonstration/implementation projects, (3) generate knowledge products that contribute to ability to make data-driven decisions to prioritize corrosion prevention investments. Research areas include:

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604016D8Z / *Department of Defense Corrosion Program*	**Project (Number/Name)** 015 / *Corrosion Protection Projects*

- Improved and validated data analytics and predictive modeling
- Accelerated corrosion test method development
- Improved surface treatments and coatings
- New materials and materials processing techniques

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Corrosion Prevention and Control Projects and Activities	3.232	3.323	3.259

Description: Corrosion prevention and control projects and activities are conducted in support of the support of the strategic plan to reduce the impact of corrosion on the cost and availability of DoD equipment and facilities. Projects initiated in FY 2020 include:
•Zinc-rich Aerosol Products for Touch-up Painting of Steel Substrates – Increased efficiency of maintenance processes
•Improved Surface Preparation and Coatings for Corrosion Control of Aluminum Substrates – Extending intervals between coating applications
•Pressure Sensitive Adhesive Appliques for Quick Field Repair of Topcoat Damage – Improved field-level maintenance
•Weld-Through Coatings for Prevention of Crevice Corrosion in Skip-Welded Joints – Service life extension for ground vehicles
•COVID-19 Disinfectant Material Corrosion Compatibility testing – Understanding potential maintenance impacts resulting from disinfectant application

Support for advanced research in the areas of improving the accuracy of the algorithm for extracting corrosion information from maintenance data, aircraft structural repair using additive manufacturing, optimizing aircraft washdown intervals, corrosion sensor development, analytical corrosion prediction methods, mitigation of biologically induced corrosion, and prediction of environmentally assisted cracking was continued.

Activities executed included:
• Delivery of corrosion control and coatings training to field- and depot-level workforce
• Development of computer-based corrosion prevention design, management, and sustainment training for the acquisition workforce and facilities engineers
• Validation of Cost of Corrosion data for Navy Surface Ships
• Technical revisions to three corrosion-related military specifications

FY 2021 Plans:
• Selected and Funded FY 2021 long term Corrosion Demonstration/Validation Projects:
• GentooTM Coating Application to HH-60G Tail Landing Gear Yoke (Aerospace Systems)
Targeted Outcomes: Demonstrate a 240 hr total reduction in Non-Available Time and associated maintenance hours for a H-60 squadron.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604016D8Z / *Department of Defense Corrosion Program*	**Project (Number/Name)** 015 / *Corrosion Protection Projects*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
• Improved Landing Gear (LG) Durability for F/A-18E/F Super Hornet (Aerospace Systems) Targeted Outcomes: Reduction in LG corrosion maintenance, extending maintenance intervals from 84 days out 185 days - 365 days; and reduce unscheduled maintenance and repairs. • Ship Class Topside Corrosion Control Configuration (CT3C) Implementation (Ships) Targeted Outcomes: Reduce Maintenance Meantime of Organizational-level corrosion maintenance by 3,411 hrs per yer per LDP ship (44,343 hrs for the entire class of ship) • Environmentally Friendly Coating Assessment for Non-Immersed Marine Environments (Facilities) Targeted Outcomes: Validate a coating system with increased durability and corrosion performance reduces implementation costs by $6.85 per sq-ft. • Continue COVID-19 Disinfectant Material Corrosion Compatibility testing • Executing DoD Civilian Workforce CPC and Painter Application Project. • Corrosion Prevention Planning Risk Assessment Validation • Update Corrosion Maintenance algorithms to improve accuracy of aviation and ground vehicle data extraction from maintenance records • Continue support for advanced research projects ***FY 2022 Plans:*** • Yr 2 increment funding for FY 2021 long term Corrosion Demonstration/Validation Projects • Continue support for advanced research projects ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The FY 2022 Program Adjustment will result in a decrease in the investment in corrosion Demonstration/Validation Projects and Advanced Research projects.			
Accomplishments/Planned Programs Subtotals	3.232	3.323	3.259

	FY 2020	FY 2021
Congressional Add: Coating technology and requirements development for facilities and infrastructure ***FY 2020 Accomplishments:*** Funding sent to Army Corps of Engineers Construction Engineering Research Laboratory (CERL) for collaborative RDT&E effort with industry to expand and improve infrastructure R&D capabilities.	5.000	-
Congressional Add: DoD Workforce Painter Training	2.800	2.000

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604016D8Z / *Department of Defense Corrosion Program*	**Project (Number/Name)** 015 / *Corrosion Protection Projects*

	FY 2020	FY 2021
FY 2020 Accomplishments: Initiated Depot Survey on current workforce painter training requirements and content. Performing analysis of current DoD workforce painter training. ***FY 2021 Plans:*** Targeted Outcomes: (a) Identify current best practices, (b) Identify parameters for various painter training methodologies that are most effective within DoD Depot environment(s), (c) Advocate for the revision of the OPM Painter tradecraft position description (latest version is dated 1968), (d) Engage with USD(PR) to advocate for improved painter workforce training requirements within the OSD Strategic Human Capital Planning Process. Identifying painter training needs and gaps. Assessing multiple painter training methodologies and technologies.		
Congressional Add: General DoD Corrosion Program Increase ***FY 2020 Accomplishments:*** Performed Material Corrosion Compatibility testing to qualify the best COVID-19 Chemical Disinfectants for use on DoD weapon systems to minimize the detrimental sustainment impacts resulting from disinfectant chemicals while maximizing the health protection to maintainers and operators. Identified four products that achieve disinfection with minimal corrosion impacts. The Naval Air Systems Command issued a letter authorizing these products for use on Naval aviation systems. This information has been shared with the Air Force, Navy Research Lab and Army for consideration of similar authorizations.	2.000	-
Congressional Adds Subtotals	9.800	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 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604016D8Z / *Department of Defense Corrosion Program*	Project (Number/Name) 015 / *Corrosion Protection Projects*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Corrosion Policy and Oversight	MIPR	Various (Army, Navy, Air Force) : Various	111.057	6.285	Jan 2020	2.677	Oct 2021	0.000		-		0.000	-	-	-
		Subtotal	111.057	6.285		2.677		0.000		-		0.000	-	-	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Research Studies	C/FFP	Various : Various	-	2.402	Mar 2021	-		1.753	Mar 2022	-		1.753	-	-	-
Technical Support	MIPR	Various (Army, Navy, Air Force) : Various	-	-		0.408	Jun 2021	0.158	Jun 2022	-		0.158	-	-	-
Technical Support	Option/ FFP	Leidos, Inc. : Virginia	-	0.496	Mar 2021	-		-		-		-	-	-	-
Technical Support	C/FFP	Excet Inc. : Maryland	-	-		0.210	Jun 2021	0.221	Jun 2022	-		0.221	-	-	-
		Subtotal	-	2.898		0.618		2.132		-		2.132	-	-	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Critical Compatibility Testing - COVID19 (FY20 Congressional-Add)	MIPR	Various (Army, Navy, Air Force) : Various	-	0.850	Oct 2020	1.841	Jun 2021	-		-		-	-	-	-
		Subtotal	-	0.850		1.841		-		-		-	-	-	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Corrosion Policy and Oversight	C/FFP	Logistics Management	21.218	1.976	Feb 2020	0.000		0.943	Feb 2022	-		0.943	-	-	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604016D8Z / *Department of Defense Corrosion Program*	Project (Number/Name) 015 / *Corrosion Protection Projects*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
		Institute : McLean, VA													
Corrosion Policy and Oversight	Option/ FFP	LMI : McLean, VA	-	1.023	Mar 2021	-		-		-		-	-	-	-
SBIR/STTR Funding	Allot	OSD : Virginia	-	-		0.123	Jun 2021	0.120	Jun 2022	-		0.120	-	-	-
USD(A&S) Management Reserve	Allot	USD(A&S) : Virginia	-	-		0.064	Jun 2021	0.064	Jun 2022	-		0.064	-	-	-
		Subtotal	21.218	2.999		0.187		1.127		-		1.127	-	-	N/A

	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	132.275	13.032		5.323		3.259		-		3.259	-	-	N/A

Remarks

N/A

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604016D8Z / *Department of Defense Corrosion Program*	**Project (Number/Name)** 015 / *Corrosion Protection Projects*



Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604016D8Z / *Department of Defense Corrosion Program*	**Project (Number/Name)** 015 / *Corrosion Protection Projects*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Corrosion Policy and Oversight				
Zinc-rich aerosol products for touch-up painting of steel substrates	3	2020	4	2021
Improved surface preparation and coatings for corrosion control of aluminum substrates	3	2020	4	2021
Pressure sensitive adhesive appliques for quick field repair of topcoat damage	3	2020	4	2021
Weld-through coatings for prevention of crevice corrosion in skip-welded joints	3	2020	4	2021
COVID-19 disinfectant material corrosion compatibility testing	2	2020	4	2021
Implementation of Zinc-Nickel (1Z-C17 +Zn-Ni) Electroplating as an Alternative to Cadmium	3	2016	4	2021
GentooTM Coating Application to HH-60G Tail Landing Gear Yoke	2	2021	1	2023
Improved Landing Gear Durability for F/A-18E/F Super Hornet	2	2021	4	2024
Ship Class Topside Corrosion Control Configuration (CT3C) Implemetation	2	2021	4	2024
Environmentally Friendly Coating Assessment for Non-Immersed Marine Environment	2	2021	4	2022
Improving the accuracy of the algorithm for extracting corrosion information from maintenance data	1	2020	4	2020
Aircraft structural repair using additive manufacturing	4	2018	1	2023
Optimizing aircraft washdown intervals	4	2018	1	2021
Corrosion sensor development	4	2018	4	2020
Analytical corrosion prediction methods	4	2018	1	2023
Mitigation of biologically induced corrosion	4	2018	1	2023
Prediction of environmentally assisted cracking	4	2018	1	2022
DoD Workforce Painter Training	2	2020	4	2021

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604132D8Z / *Missile Defeat Project*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	301.336	14.288	0.000	0.000	-	0.000	-	-	-	-	-	-
072: *Missile Defeat Project*	301.336	14.288	0.000	0.000	-	0.000	-	-	-	-	-	-

Program MDAP/MAIS Code:
Project MDAP/MAIS Code(s): 000

Note

In FY 2021, Missile Defeat Project resources transferred to Program Element 0603338D8Z (Defense Modernization and Prototyping), Project Code 722, Time Sensitive Targeting and Defeat (TSTD), to provide alignment and focus on the development of key technologies and modernization within OUSD(R&E) identified capability thrust priorities.

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 2017 National Defense Authorization Act, in FY 2019, the Missile Defeat Project transferred activities initiated under Missile Defeat to other stakeholders. In FY 2021, Missile Defeat Project residual resources and capabilities transferred to Program Element 0603338D8Z (Defense Modernization and Prototyping), Project Code 722, Time Sensitive Targeting and Defeat (TSTD), in support of an expanded Multi-Domain TSTD alignment of key technology development and modernization.

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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	14.816	0.000	0.000	-	0.000
Current President's Budget	14.288	0.000	0.000	-	0.000
Total Adjustments	-0.528	0.000	0.000	-	0.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.525	-			
• Program Adjustments	-0.003	-	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604132D8Z / *Missile Defeat Project*	Project (Number/Name) 072 / *Missile Defeat Project*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
072: *Missile Defeat Project*	301.336	14.288	0.000	0.000	-	0.000	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Project MDAP/MAIS Code: 000

Note

In FY 2021, Missile Defeat Project resources transferred to Program Element 0603338D8Z (Defense Modernization and Prototyping), Project Code 722, Time Sensitive Targeting and Defeat (TSTD), to
provide alignment and focus on the development of key technologies and modernization within OUSD(R&E) identified capability thrust priorities.

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 2020	FY 2021	FY 2022
Title: Missile Defeat Project efforts	14.288	-	-
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 of the find fix target track capabilities against time sensitive targets. • Integrated enhancement to the common intel picture enhancement by fusing a myriad of tactical and national data feeds in near-real time. • Instituted the SNAPGLASS module to fill existing seams across an element of kill chains to reduce latency. • Executed a live fly exercise called JUKEBOX 18 (JB18) to demonstrate incorporated prototype capabilities enabling new kill webs for future weapon systems. • Demonstrated the deployment of synthetic aperture radar and C2 payloads during JB18 to show case the evolution of future warfare. • FY 2021 residual resources are transferred to Program Element 0603338D8Z (Defense Modernization and Prototyping), Project Code 722, Time Sensitive Targeting and Defeat (TSTD).			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604132D8Z / *Missile Defeat Project*	**Project (Number/Name)** 072 / *Missile Defeat Project*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Accomplishments/Planned Programs Subtotals	14.288	-	-

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), Project Code 722, Time Sensitive Targeting and Defeat (TSTD) in support of an expanded Multi-Domain TSTD alignment of key technology development and modernization.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604132D8Z / *Missile Defeat Project*	Project (Number/Name) 072 / *Missile Defeat Project*	

Test and Evaluation ($ in Millions)

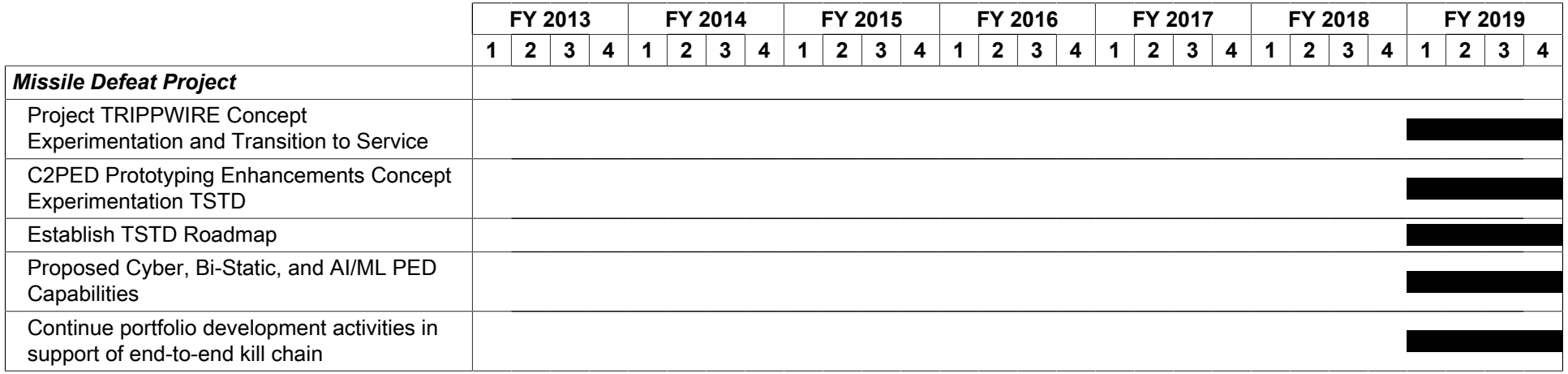
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Various	C/TBD	MULTI : MULTI	301.336	14.288		-		-		-		-	Continuing	Continuing	-
		Subtotal	301.336	14.288		-		-		-		-	Continuing	Continuing	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	301.336	14.288		0.000		-		-		-	Continuing	Continuing	N/A

Remarks

N/A

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604132D8Z / *Missile Defeat Project*	**Project (Number/Name)** 072 / *Missile Defeat Project*



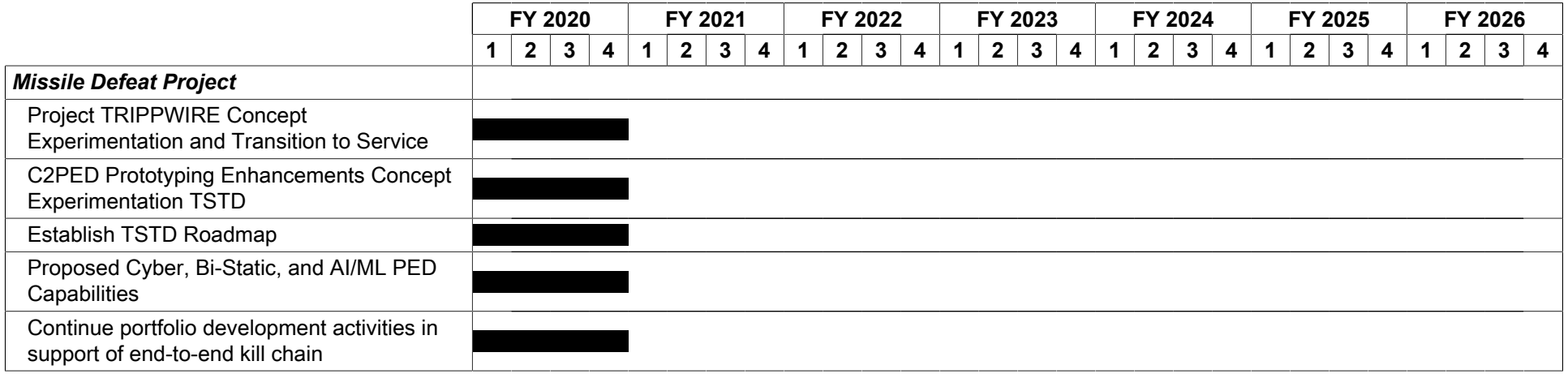


Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604132D8Z / *Missile Defeat Project*	**Project (Number/Name)** 072 / *Missile Defeat Project*

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

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604250D8Z / *Advanced Innovative Technologies*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	4,052.705	1,106.137	749.030	716.456	-	716.456	-	-	-	-	-	-
250: *Advanced Innovative Technologies*	4,029.318	1,079.137	718.908	716.456	-	716.456	-	-	-	-	-	-
295: *SCO Cyber Efforts*	23.387	27.000	30.122	-	-	-	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

The Strategic Capabilities Office (SCO) develops, demonstrates, and transitions game-changing capabilities to shape and counter emerging threats and increase the lethality of the Joint Force in contested environments. The SCO combines capability innovation with concepts of operation 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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	1,133.365	730.508	635.984	-	635.984
Current President's Budget	1,106.137	749.030	716.456	-	716.456
Total Adjustments	-27.228	18.522	80.472	-	80.472
• Congressional General Reductions	-	-0.478			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	19.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-1.800	-			
• SBIR/STTR Transfer	-25.234	-			
• Cancelled Account Adjustments	-0.194	-	-	-	-
• Program Adjustments	-	-	80.472	-	80.472

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2020	FY 2021
Project: 250: *Advanced Innovative Technologies*		
Congressional Add: *Smarter Machine Learning*	14.500	-
Congressional Add: *Micro Nuclear Reactor Program (Pele)*	63.000	70.000
Congressional Add Subtotals for Project: 250	77.500	70.000
Congressional Add Totals for all Projects	77.500	70.000

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604250D8Z *I Advanced Innovative Technologies*

Change Summary Explanation

The FY 2022 funding request was reduced by $62.729 million to account for the availability of prior year execution balances.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604250D8Z / *Advanced Innovative Te chnologies*	Project (Number/Name) 250 / *Advanced Innovative Technologies*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
250: *Advanced Innovative Technologies*	4,029.318	1,079.137	718.908	716.456	-	716.456	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Strategic Capabilities Office (SCO) develops, demonstrates, and transitions game-changing capabilities to shape and counter emerging threats and increase the lethality of the Joint Force in contested environments. 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 2020	FY 2021	FY 2022
Title: Advanced Navigation ***Description:*** Leverage existing technologies to analyze, build and demonstrate a prototype advanced navigation technique for contested environments and integrate into a mature weapons system.	0.064	-	-
Title: Alternate Strike ***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. ***FY 2021 Plans:*** Specific applications and detailed plans are available at a higher classification level. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The decrease from FY 2021 to FY 2022 is due to completion of this project.	63.229	21.107	-
Title: Aurora ***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. ***FY 2021 Plans:*** • Obtain authority to connect on proper network(s)	13.922	17.511	17.589

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604250D8Z / *Advanced Innovative Technologies*	**Project (Number/Name)** 250 / *Advanced Innovative Technologies*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
• Complete intel analysis • Selection of threat models • Begin operationally relevant demonstrations ***FY 2022 Plans:*** • Integrate user feedback • Additional threat models • Scale to larger volume of assets • Capstone demonstration prior to transition ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The decrease from FY 2021 to FY 2022 is due to the program plan which is available at higher classification levels.			
Title: Avatar	60.174	32.500	52.150
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. ***FY 2021 Plans:*** • Complete mission and operational effectiveness analysis. • Continue open systems architecture refinement. • Continue autonomous behavior algorithm refinement • Continue hardware in the loop testing of prototype manned-unmanned teaming capabilities to confirm design and functionality. • Continue flight demonstration of autonomy behaviors on unmanned platforms. • Continue integration of payloads onto operational platforms. • Continue Pilot in the Loop simulation testing. • Initiate large scale Manned-Unmanned Teaming demonstration with operational aircraft, ***FY 2022 Plans:*** • Complete open systems architecture refinement. • Complete autonomous behavior algorithm refinement • Continue hardware in the loop testing of prototype manned-unmanned teaming capabilities to confirm design and functionality. • Continue flight demonstration of autonomy behaviors on unmanned platforms. • Continue integration of payloads onto operational platforms. • Continue Pilot in the Loop simulation testing.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604250D8Z / *Advanced Innovative Technologies*	**Project (Number/Name)** 250 / *Advanced Innovative Technologies*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
• Continue large scale Manned-Unmanned Teaming demonstration with operational aircraft ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The increase from FY 2021 to FY 2022 is consistent with the planned program which is available at higher classification levels.			
Title: Breaker ***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.	8.172	-	-
Title: Carnac ***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. ***FY 2021 Plans:*** • Integration of machine learning algorithms • Conduct prototype demonstration tests ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The decrease of $6.400 million from FY 2021 to FY 2022 is due the completion of the project.	20.700	6.400	-
Title: CD ATACMS Support ***Description:*** These funds support transition of CD ATACMS to the Army.	4.383	-	-
Title: Chaos ***Description:*** The Chaos program provides a novel capability to support ground operations. Specific applications and detailed plans are available at a higher classification level.	13.820	-	-
Title: Classified Projects ***Description:*** Due to the classified nature of these projects, specific applications and details are available at a higher classification level. ***FY 2021 Plans:*** Due to the classified nature of these projects, specific applications and details are available at a higher classification level. ***FY 2022 Plans:***	107.536	331.645	292.011

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604250D8Z / *Advanced Innovative Technologies*	**Project (Number/Name)** 250 / *Advanced Innovative Technologies*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Due to the classified nature of these projects, specific applications and details are available at a higher classification level. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Due to the classified nature of these projects, specific applications and details are available at a higher classification level.			
Title: C2IE ***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.	0.060	-	-
Title: Contender ***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.	32.198	-	-
Title: Eclipse ***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. ***FY 2021 Plans:*** • Continue analysis to define system characteristics and measures of effectiveness • Conduct integrated platform testing in multiple domains and modalities • Complete physical design evaluations and modifications ***FY 2022 Plans:*** • Conduct software/hardware demo for multiple domains and modalities • Transition existing risk reduction results to new industry performers • Establish metadata and interface standards for industry performers • Establish metric quantities and process for verification and validation • Establish modeling and simulation environments • Conduct recurring digital example generation and reinjection process ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The increase from FY 2021 to FY 2022 is consistent with the planned program phasing which is available at higher classification levels.	22.200	15.130	25.300
Title: Ghost Fleet	110.168	29.203	-

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604250D8Z / *Advanced Innovative Technologies*	**Project (Number/Name)** 250 / *Advanced Innovative Technologies*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
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. ***FY 2021 Plans:*** Due to the nature of this project, specific applications and detailed plans are available at a higher classification level. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The decrease from FY 2021 to FY 2022 is due to completion of this project and transition to the Navy.			
Title: Hoover ***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. ***FY 2021 Plans:*** • Continued integration activities • Conduct prototype demonstration tests • Refinement of machine learning algorithms based on feedback during demonstrations ***FY 2022 Plans:*** • Incorporate feedback from FY21 demonstration events • Conduct additional prototype demonstration tests • Continued refinement of machine learning algorithms ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The decrease from FY 2021 to FY 2022 is due to the completion of the acquisition of several major hardware components.	71.375	61.781	32.030
Title: Hornet's Nest ***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.	56.361	-	-
Title: Hurt Locker	44.000	29.255	13.500

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604250D8Z / *Advanced Innovative Technologies*	**Project (Number/Name)** 250 / *Advanced Innovative Technologies*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
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. ***FY 2021 Plans:*** • Continue hardware and software system integration spirals. • Conduct system demonstrations to support final design spiral for service transition. • Develop detailed sensor and communications element designs to support prototype development for additional mission areas. • Integrate existing sensor and communications elements into an initial prototype system for early demonstration and service transition. ***FY 2022 Plans:*** • Continue hardware fabrication of an alternative communications element and integrate with the prototype system. • Implement hardware and software modifications to the prototype system configuration for additional existing weapons control systems. • Finalize hardware and software integration of additional sensor and communications elements to support an extended prototype demonstration in FY 2023 for additional mission areas. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The decrease from FY 2021 to FY 2022 is to execute the follow-on design iteration specified in FY 2021 tasking. Additional details at a higher classification level.			
Title: Hypervelocity Gun Weapon System (HGWS) ***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. ***FY 2021 Plans:*** No funding in FY 2021. ***FY 2022 Plans:*** The HGWS project will support Pre-Engineering & Manufacturing Development (EMD) activities for the radar, gun, fire direction, and projectile related to transition efforts. ***FY 2021 to FY 2022 Increase/Decrease Statement:***	6.975	0.000	20.000

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604250D8Z / *Advanced Innovative Technologies*	**Project (Number/Name)** 250 / *Advanced Innovative Technologies*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
The increase of $20 millions from FY 2021 to FY 2022 will support pre-engineering and manufacturing development activities for the radar, gun, fire detection, and projectile related to transition efforts.			
Title: Kingfisher ***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.	1.578	-	-
Title: LiTE Saber ***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. ***FY 2021 Plans:*** Due to the nature of this project, specific applications and detailed plans are available at a higher classification. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The decrease from FY 2021 to FY 2022 is due to completion of this project.	21.324	10.964	-
Title: Maven ***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.	10.000	-	-
Title: Mission Support ***Description:*** These funds provide management and administrative support costs for the Strategic Capabilities Office. These costs include reimbursable personnel funding, building rent, physical security, travel, supplies and equipment, information technology, contractor support (Systems Engineering and Technical Assistance (SETA)), and the SBIR/STTR assessment. ***FY 2021 Plans:*** These funds provide management and administrative support costs for the Strategic Capabilities Office. These costs include reimbursable personnel funding, building rent, physical security, travel, supplies and equipment, information technology, contractor support (Systems Engineering and Technical Assistance (SETA)). This also includes required funding for SBIR/STTR. ***FY 2022 Plans:***	70.524	50.856	58.458

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604250D8Z / *Advanced Innovative Technologies*	**Project (Number/Name)** 250 / *Advanced Innovative Technologies*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
These funds provide management and administrative support costs for the Strategic Capabilities Office. These costs include reimbursable personnel funding, building rent, physical security, travel, supplies and equipment, information technology, contractor support (Systems Engineering and Technical Assistance (SETA)). This also includes required funding for SBIR/STTR. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The increase from FY 2021 to FY 2022 is a result of the organization-wide relocation to a new facility and increased sustainment support costs which will be stabilizing in FY 2022.			
Title: Motley Crew ***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.	11.987	-	-
Title: Pele ***Description:*** Develop a prototype transportable nuclear microreactor to provide resilient power for a variety of DoD missions. Due to the nature of this project, specific applications and detailed plans are available at a higher classification level. ***FY 2022 Plans:*** The Pele project continues activities initiated under Congressional direction in FY 2020 and FY 2021. Pele will complete the design phase and prepare for construction of a 1-5 Megawatt electric transportable nuclear microreactor. Due to the nature of this project, specific applications and detailed plans are available at a higher classification level. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The Pele project continues activities initiated under Congressional direction in FY 2020 and FY 2021. Pele will complete the design phase and prepare for construction of a 1-5 Megawatt electric transportable nuclear microreactor. Due to the nature of this project, specific applications and detailed plans are available at a higher classification level.	-	-	60.000
Title: Perdix Gen 7 ***Description:*** Develop next generation micro-UAV (unmanned air vehicle) with improved endurance and processing power to allow for multi-mission capabilities. Due to the nature of this project, specific applications and detailed plans are available at a higher classification level.	4.807	-	-
Title: Point Break	0.000	-	16.600

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604250D8Z / *Advanced Innovative Technologies*	**Project (Number/Name)** 250 / *Advanced Innovative Technologies*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Description: Due to the classified nature of these projects, specific applications and details are available at a higher classification level. ***FY 2022 Plans:*** Due to the classified nature of these projects, specific applications and details are available at a higher classification level. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Due to the classified nature of these projects, specific applications and details are available at a higher classification level.			
Title: Quiet Riot ***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. ***FY 2022 Plans:*** • Perform test & evaluation to determine technical and operational effectiveness ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The increase from FY 2021 to FY 2022 is due to anticipated completion of test planning and completion of feasibility assessments for certain sub-elements. Further information available on higher classification system.	5.272	-	8.018
Title: Sea Dragon ***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. ***FY 2021 Plans:*** Due to the nature of this project, specific applications and detailed plans are available at a higher classification level. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The decrease from FY 2021 to FY 2022 is due to completion of this project.	40.917	2.713	-
Title: Sea Stalker ***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.	6.257	2.340	-

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604250D8Z / *Advanced Innovative Technologies*	**Project (Number/Name)** 250 / *Advanced Innovative Technologies*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
FY 2021 Plans: Due to the nature of this project, specific applications and detailed plans are available at a higher classification level. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The decrease from FY 2021 to FY 2022 is due to completion of this project.			
Title: Serenity ***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. ***FY 2021 Plans:*** 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. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The decrease from FY 2021 to FY 2022 is due to completion of this project.	8.465	0.660	-
Title: Shawshank ***Description:*** The Shawshank program provides Special Operations Forces new and enhanced capabilities. Specific applications and detailed plans are available at a higher classification level. ***FY 2021 Plans:*** • Continue engineering feasibility assessments • Model testing and refinement • Acquire/build prototypes ***FY 2022 Plans:*** • Model testing and refinement • Acquire/build prototypes ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The decrease from FYY 2021 to FY 2022 is consistent with the planned program phasing which is available at higher classification levels.	112.610	33.592	30.800
Title: Sirena	-	-	90.000

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604250D8Z / *Advanced Innovative Technologies*	**Project (Number/Name)** 250 / *Advanced Innovative Technologies*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Description: Due to the classified nature of these projects, specific applications and details are available at a higher classification level. ***FY 2022 Plans:*** Due to the classified nature of these projects, specific applications and details are available at a higher classification level. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Due to the classified nature of these projects, specific applications and details are available at a higher classification level.			
Title: Strike-X ***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.	10.012	-	-
Title: StormSystem ***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. ***FY 2021 Plans:*** Funds are requested to complete integration of components and test the prototype at the transition location. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The decrease is due to the completion of this project.	8.385	2.445	-
Title: Third Eye ***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.	13.853	-	-
Title: Vanguard ***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.	11.384	-	-
Title: Wildcat	28.925	0.806	-

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604250D8Z / *Advanced Innovative Te chnologies*	**Project (Number/Name)** 250 / *Advanced Innovative Technologies*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
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. ***FY 2021 Plans:*** 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. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The program is complete after FY 2021.			
Accomplishments/Planned Programs Subtotals	1,001.637	648.908	716.456

	FY 2020	FY 2021
Congressional Add: Smarter Machine Learning ***FY 2020 Accomplishments:*** FY 2020 Congressional add.	14.500	-
Congressional Add: Micro Nuclear Reactor Program (Pele) ***FY 2020 Accomplishments:*** FY 2020 Congressional add. ***FY 2021 Plans:*** FY 2021 Congressional add.	63.000	70.000
Congressional Adds Subtotals	77.500	70.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604250D8Z / *Advanced Innovative Technologies*	Project (Number/Name) 250 / *Advanced Innovative Technologies*	

Product Development ($ in Millions)				FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Advanced Navigation	C/Various	Various : Various	58.269	0.064	Mar 2020	-		-		-		-	-	-	-
Alternate Strike	MIPR	Various : Various	375.903	63.229	Aug 2020	21.107		-		-		-	-	-	-
Aurora	C/TBD	Various : Various	0.580	13.922	Dec 2019	17.511	Dec 2020	17.589	Dec 2021	-		17.589	-	-	-
Avatar	MIPR	Various : Various	126.976	60.174	Dec 2019	32.500	Dec 2020	52.150	Dec 2021	-		52.150	-	-	-
Breaker	C/CPFF	Various : Various	56.291	8.172	Mar 2020	-		-		-		-	-	-	-
Carnac	MIPR	Various : Various	19.898	20.700	Jan 2020	6.400	Jan 2021	-		-		-	-	-	-
CD ATACMS Support	C/Various	Various : Various	0.554	4.383	Jan 2020	-		-		-		-	-	-	-
Chaos	C/TBD	Various : Various	0.580	13.820	Dec 2019	-		-		-		-	-	-	-
Classified Projects	C/TBD	TBD : TBD	-	107.536	Jan 2020	331.645	Jan 2021	292.011	Jan 2022	-		292.011	-	-	-
C2IE	MIPR	Various : Various	89.458	0.060	Nov 2019	-		-		-		-	-	-	-
Contender	MIPR	Various : Various	231.447	32.198	Nov 2019	-		-		-		-	-	-	-
Eclipse	C/TBD	Various : Various	3.710	22.200	Dec 2019	15.130	Apr 2021	25.300	Dec 2021	-		25.300	-	-	-
Ghost Fleet	C/Various	Various : Various	235.321	110.168	Nov 2019	29.203		-		-		-	-	-	-
HGWS	C/TBD	Various : Various	765.690	6.975	Mar 2020	-		20.000	Dec 2021	-		20.000	-	-	-
Hoover	MIPR	Various : Various	108.925	71.375	Jan 2020	61.781	Nov 2020	32.030	Dec 2021	-		32.030	-	-	-
Hornet's Nest	MIPR	Various : Various	10.236	56.361	Jan 2020	-		-		-		-	-	-	-
Hurt Locker	MIPR	Various : Various	103.321	44.000	Jan 2020	29.255	Dec 2020	13.500	Dec 2021	-		13.500	-	-	-
Kingfisher	MIPR	Various : Various	39.731	1.578	Sep 2020	-		-		-		-	-	-	-
LiTE Saber	Various	Various : Various	139.018	21.324	Feb 2020	10.964		-		-		-	-	-	-
Maven	MIPR	Various, TBD : Various	20.064	10.000	Mar 2020	-		-		-		-	-	-	-
Micro Nuclear Reactor Program (Pele)	C/TBD	Various : Various	-	63.000	Mar 2020	70.000		60.000	Dec 2021	-		60.000	-	-	-
Motley Crew	MIPR	Various : Various	94.757	11.987	Jan 2020	-		-		-		-	-	-	-
Perdix Gen 7	FFRDC	Various : Various	28.366	4.807	Jan 2020	-		-		-		-	-	-	-
Mission Support	C/TBD	Various : Various	53.566	70.524	Mar 2020	50.856	Dec 2020	58.458	Dec 2021	-		58.458	-	-	-
Point Break	C/TBD	Classified : Classified	-	-		-		16.600	Jan 2022	-		16.600	-	-	-
Quiet Riot	MIPR	Various : Various	14.203	5.272	Jul 2020	-		8.018	Dec 2021	-		8.018	-	-	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604250D8Z / *Advanced Innovative Technologies*	**Project (Number/Name)** 250 / *Advanced Innovative Technologies*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Sea Dragon	Various	Various : Various	704.578	40.917	Jan 2020	2.713		-		-		-	-	-	-
Sea Stalker	MIPR	Various : Various	70.265	6.257	Jan 2020	2.340		-		-		-	-	-	-
Serenity	Various	Various : Various	34.349	8.465	Feb 2020	0.660		-		-		-	-	-	-
Shawshank	C/TBD	Various : Various	10.360	112.610	Mar 2020	33.592	Mar 2021	30.800	Dec 2021	-		30.800	-	-	-
Sirena	C/TBD	Classified : Classfied	-	-		-		90.000	Dec 2021	-		90.000	-	-	-
StormSystem	Various	Various, TBD : Various	33.154	8.385	Oct 2019	2.445	Oct 2020	-		-		-	-	-	-
Smarter Machine Learning	SS/TBD	Various : Various	45.500	14.500	Jan 2020	-		-		-		-	-	-	-
Strike-X	MIPR	Various : Various	308.526	10.012		-		-		-		-	-	-	-
Third Eye	MIPR	Various, TBD : Various	117.808	13.853	Mar 2020	-		-		-		-	-	-	-
Vanguard	C/Various	Various,TBD : Various	13.851	11.384	Feb 2020	-		-		-		-	-	-	-
Wildcat	MIPR	Various, TBD : Various	114.063	28.925	Jan 2020	0.806		-		-		-	-	-	-
		Subtotal	4,029.318	1,079.137		718.908		716.456		-		716.456	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	4,029.318	1,079.137		718.908		716.456		-		716.456	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604250D8Z / *Advanced Innovative Technologies*	**Project (Number/Name)** 250 / *Advanced Innovative Technologies*

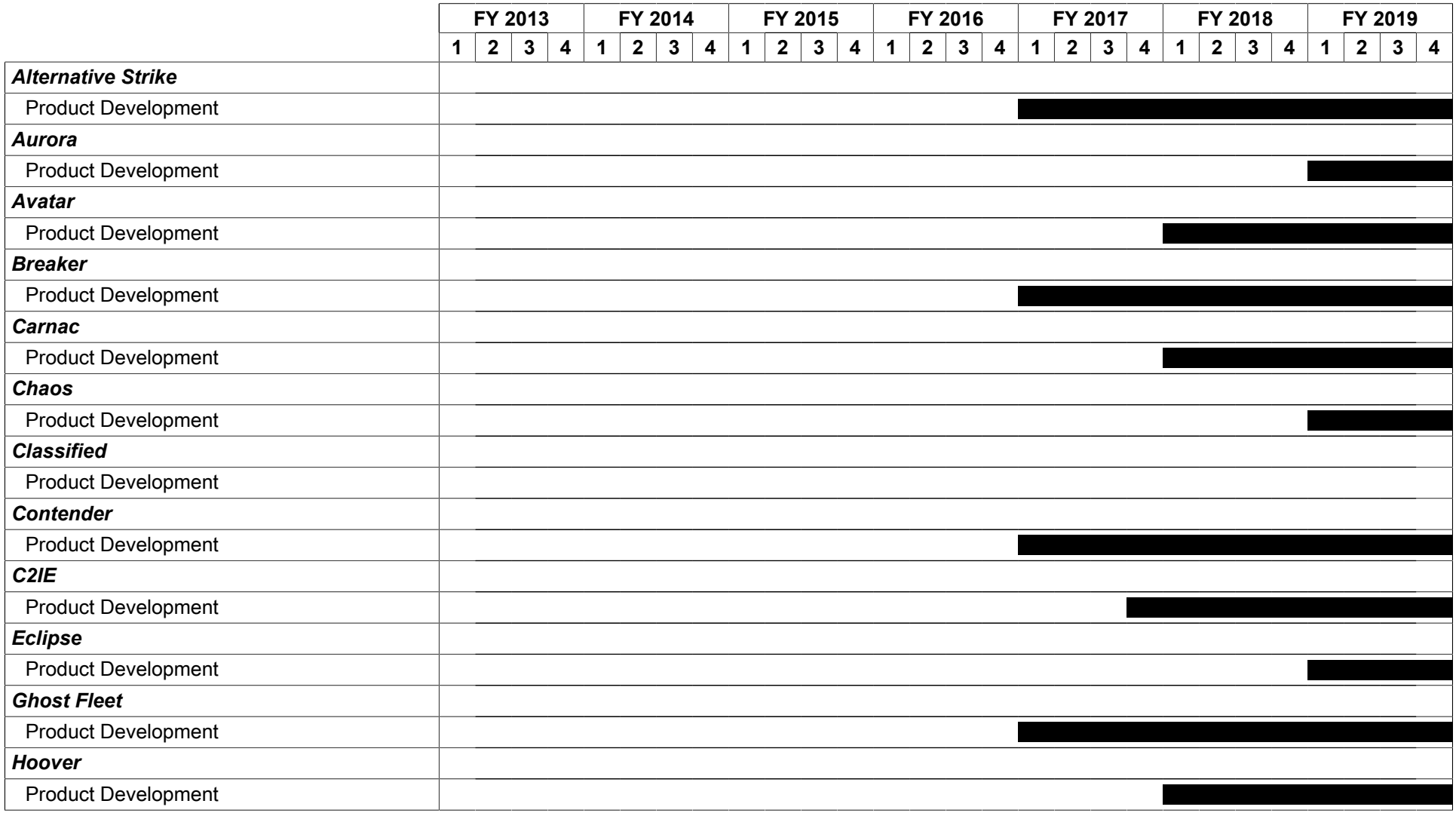


Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604250D8Z / *Advanced Innovative Te chnologies*	**Project (Number/Name)** 250 / *Advanced Innovative Technologies*

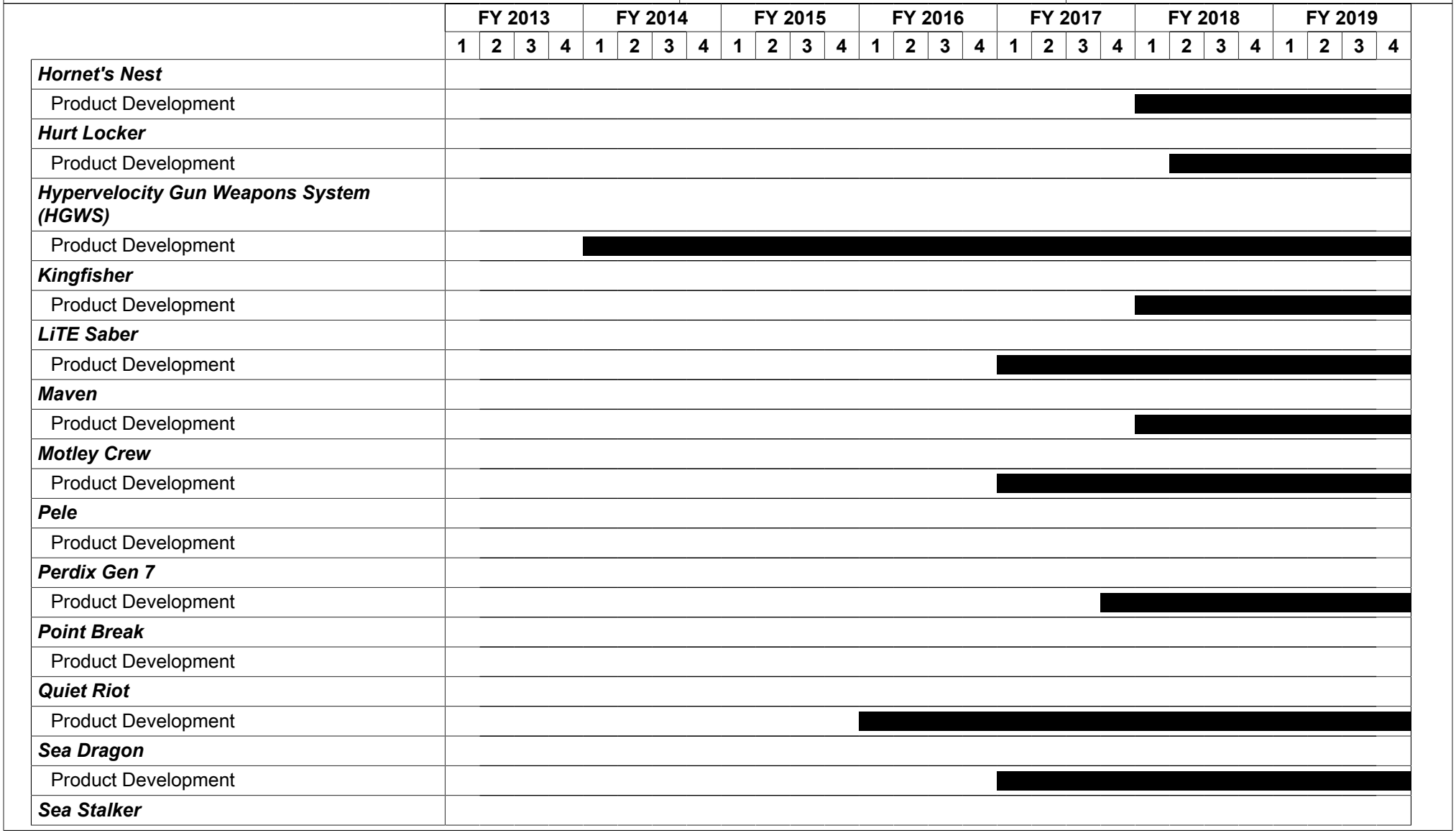
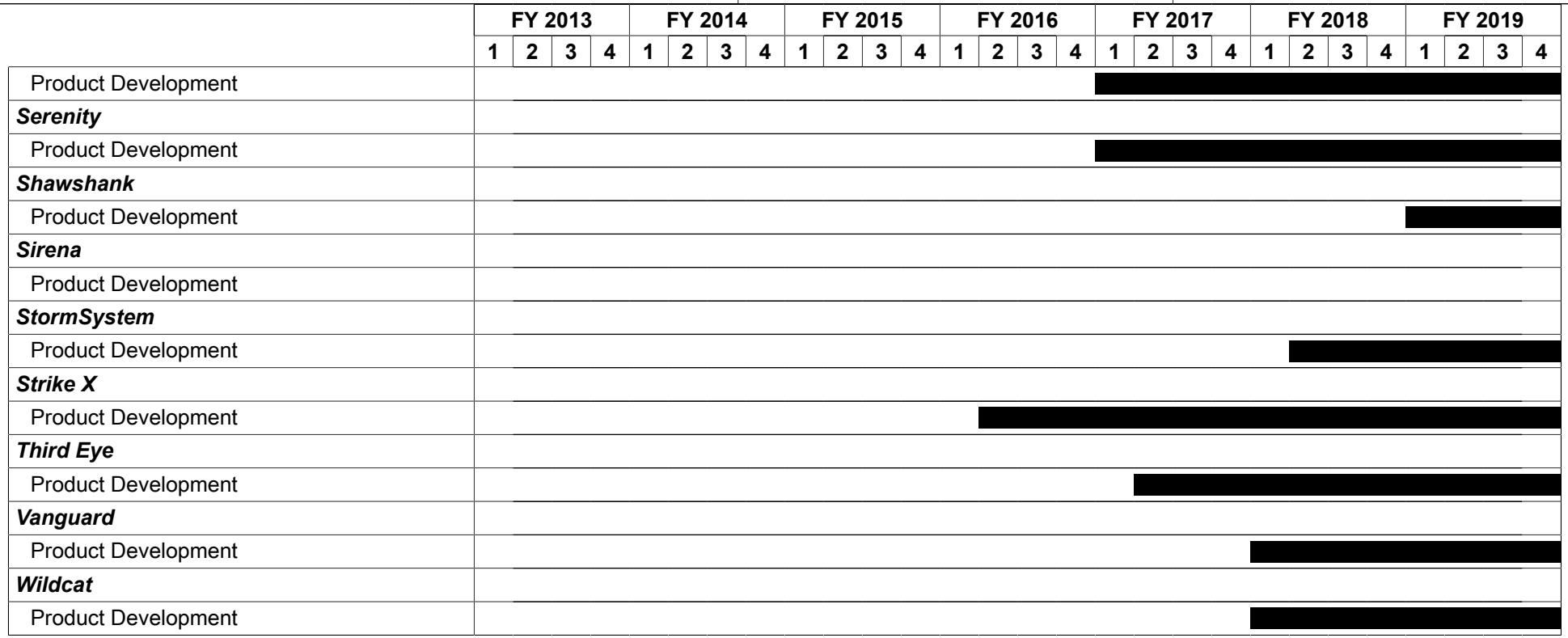


Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604250D8Z / *Advanced Innovative Te chnologies*	**Project (Number/Name)** 250 / *Advanced Innovative Technologies*



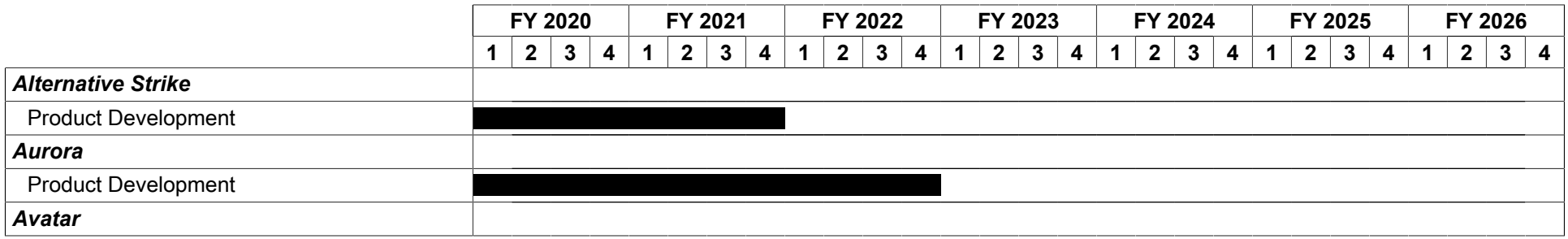


Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604250D8Z / *Advanced Innovative Technologies*	**Project (Number/Name)** 250 / *Advanced Innovative Technologies*

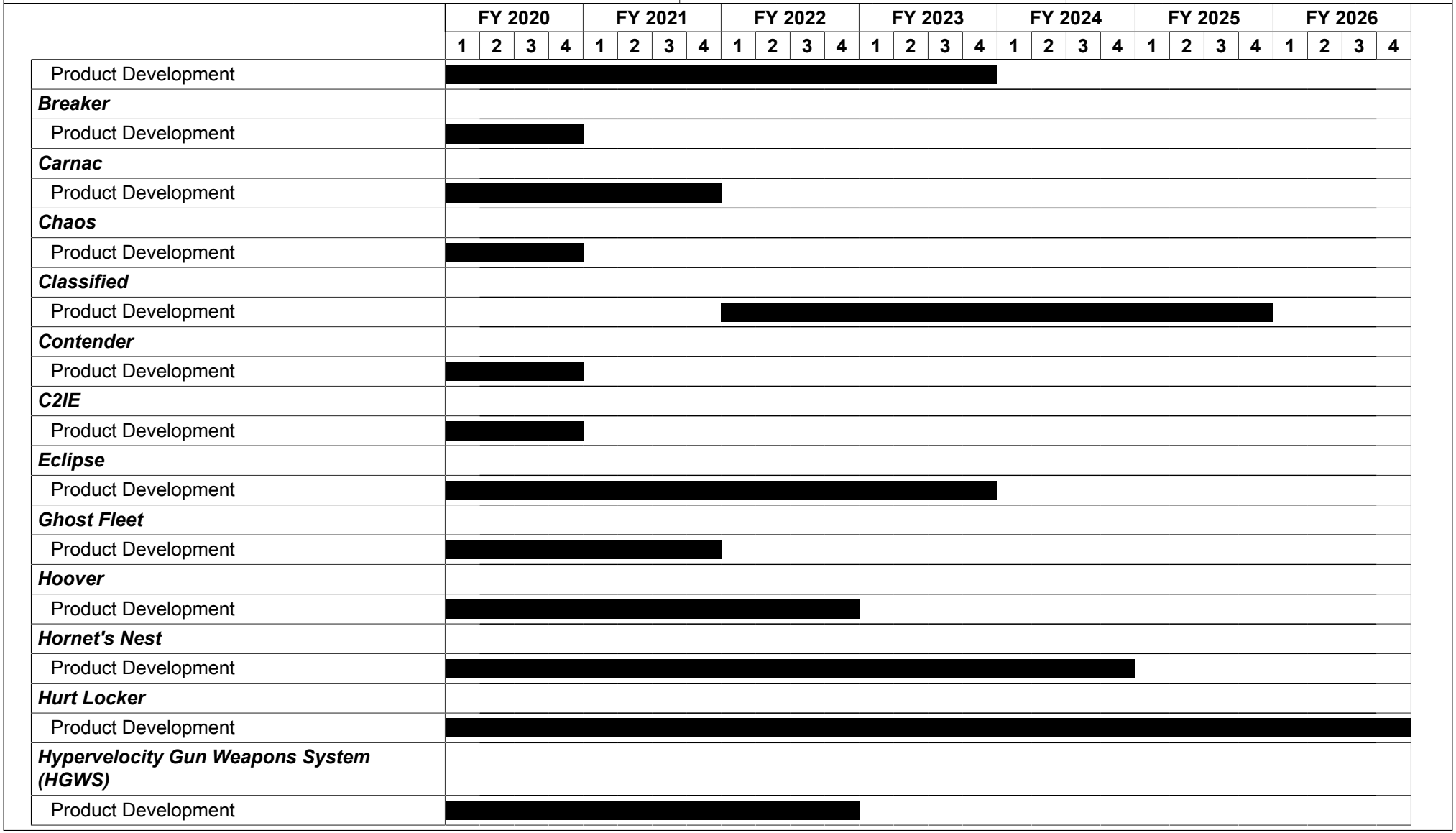


Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604250D8Z / *Advanced Innovative Technologies*	**Project (Number/Name)** 250 / *Advanced Innovative Technologies*

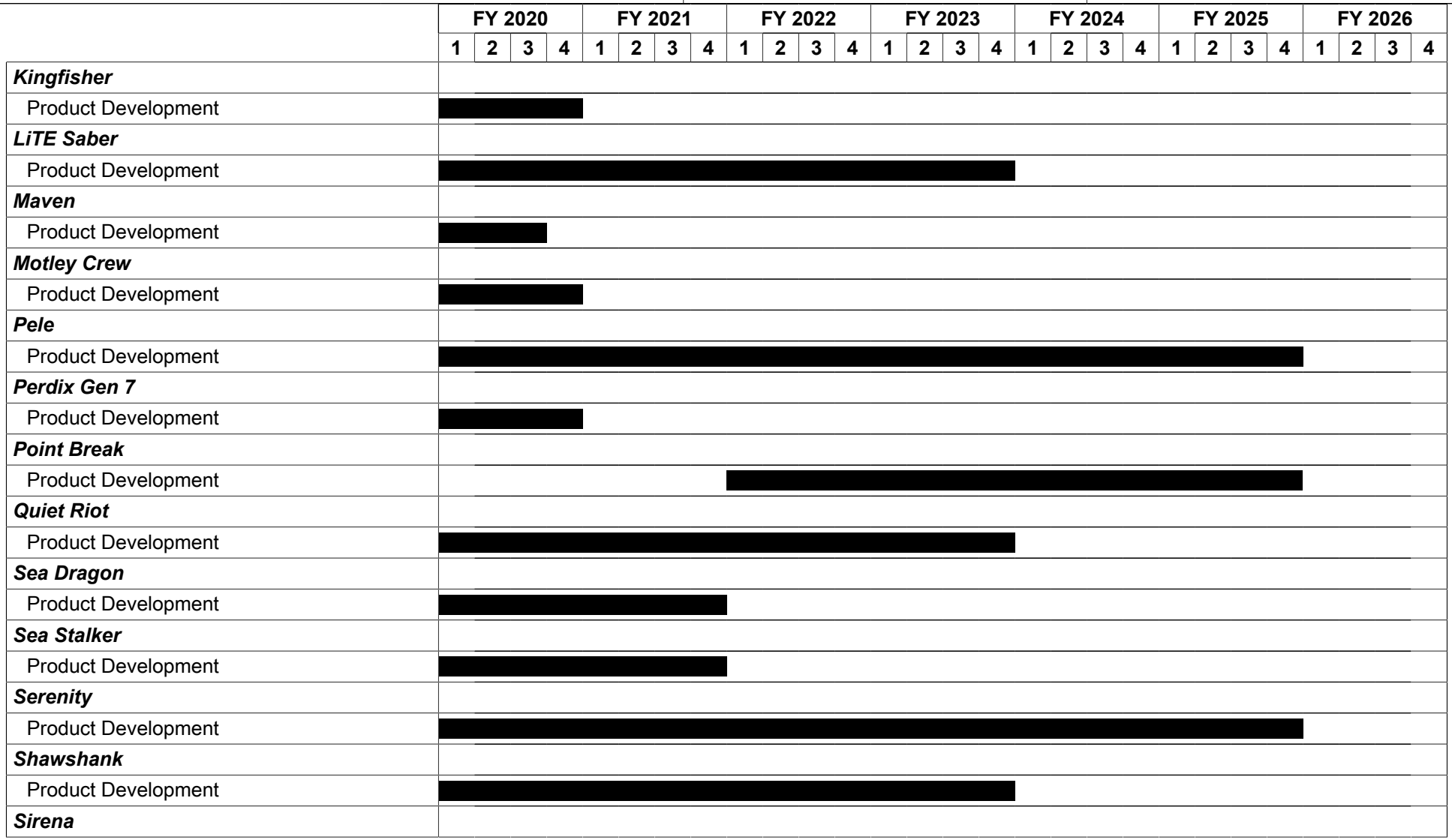


Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604250D8Z / *Advanced Innovative Te chnologies*	**Project (Number/Name)** 250 / *Advanced Innovative Technologies*

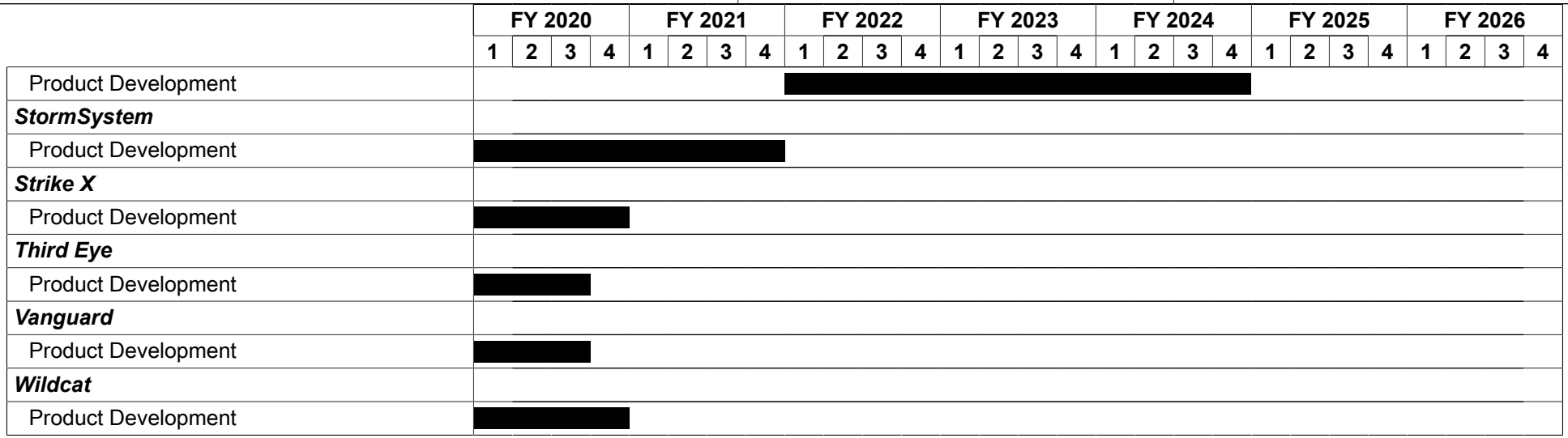


Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604250D8Z / *Advanced Innovative Technologies*	**Project (Number/Name)** 250 / *Advanced Innovative Technologies*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Alternative Strike				
Product Development	1	2017	4	2021
Aurora				
Product Development	1	2019	4	2022
Avatar				
Product Development	1	2018	4	2023
Breaker				
Product Development	1	2017	4	2020
Carnac				
Product Development	1	2018	4	2021
Chaos				
Product Development	1	2019	4	2020
Classified				
Product Development	1	2022	4	2025
Contender				
Product Development	1	2017	4	2020
C2IE				
Product Development	4	2017	4	2020
Eclipse				
Product Development	1	2019	4	2023
Ghost Fleet				
Product Development	1	2017	4	2021

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604250D8Z / *Advanced Innovative Technologies*	**Project (Number/Name)** 250 / *Advanced Innovative Technologies*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Hoover				
Product Development	1	2018	4	2022
Hornet's Nest				
Product Development	1	2018	4	2024
Hurt Locker				
Product Development	2	2018	4	2026
Hypervelocity Gun Weapons System (HGWS)				
Product Development	1	2014	4	2022
Kingfisher				
Product Development	1	2018	4	2020
LiTE Saber				
Product Development	1	2017	4	2023
Maven				
Product Development	1	2018	3	2020
Motley Crew				
Product Development	1	2017	4	2020
Pele				
Product Development	1	2020	4	2025
Perdix Gen 7				
Product Development	4	2017	4	2020
Point Break				
Product Development	1	2022	4	2025
Quiet Riot				
Product Development	1	2016	4	2023
Sea Dragon				

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604250D8Z / *Advanced Innovative Technologies*	**Project (Number/Name)** 250 / *Advanced Innovative Technologies*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Product Development	1	2017	4	2021
Sea Stalker				
Product Development	1	2017	4	2021
Serenity				
Product Development	1	2017	4	2025
Shawshank				
Product Development	1	2019	4	2023
Sirena				
Product Development	1	2022	4	2024
StormSystem				
Product Development	2	2018	4	2021
Strike X				
Product Development	2	2016	4	2020
Third Eye				
Product Development	2	2017	3	2020
Vanguard				
Product Development	1	2018	3	2020
Wildcat				
Product Development	1	2018	4	2020

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604250D8Z / *Advanced Innovative Technologies*	Project (Number/Name) 295 / *SCO Cyber Efforts*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
295: *SCO Cyber Efforts*	23.387	27.000	30.122	-	-	-	-	-	-	-	-	-
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 2020	FY 2021	FY 2022
Title: Ike	27.000	30.122	-
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. ***FY 2021 Plans:*** The Ike program provides a joint cyber platform. Specific applications and detailed plans are available at a higher classification level. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Ike transitions to the Joint Cyber Command and Control (JCC2) program management office at the end of FY 2021.			
Accomplishments/Planned Programs Subtotals	27.000	30.122	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604250D8Z / *Advanced Innovative Technologies*	**Project (Number/Name)** 295 / *SCO Cyber Efforts*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Ike	C/TBD	Various : Various	23.387	27.000	Dec 2019	30.122	Dec 2020	-		-		-	-	-	-
		Subtotal	23.387	27.000		30.122		-		-		-	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	23.387	27.000		30.122		-		-		-	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604250D8Z / *Advanced Innovative Technologies*	**Project (Number/Name)** 295 / *SCO Cyber Efforts*

	FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025				FY 2026			
	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
Product Development																												
Ike	[redacted]																											

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604250D8Z / *Advanced Innovative Technologies*	**Project (Number/Name)** 295 / *SCO Cyber Efforts*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Product Development				
Ike	1	2020	2	2021

THIS PAGE INTENTIONALLY LEFT BLANK

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense											Date: May 2021	
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0604294D8Z / *Trusted and Assured Microelectronics*							
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
Total Program Element	664.837	534.340	503.750	509.195	-	509.195	-	-	-	-	-	-
291: *Joint Federated Assurance Center*	12.000	5.887	0.000	0.000	-	0.000	-	-	-	-	-	-
645: *Verification & Validation (V&V) Capabilities and Standards for Trust*	188.836	39.117	0.000	0.000	-	0.000	-	-	-	-	-	-
646: *New Trust Approach Development*	40.023	38.247	0.000	0.000	-	0.000	-	-	-	-	-	-
647: *Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) Innovation and Development*	423.978	451.089	0.000	0.000	-	0.000	-	-	-	-	-	-
907: *Access to State-of-the-Art (SOTA) Microelectronics - Development*	0.000	0.000	281.594	297.195	-	297.195	-	-	-	-	-	-
908: *Access to Advanced Packaging and Testing - Development*	0.000	0.000	81.438	112.600	-	112.600	-	-	-	-	-	-
911: *Address DoD Unique Needs - Radiation Hardening and non-CMOS*	0.000	0.000	50.500	82.700	-	82.700	-	-	-	-	-	-
912: *Create a Quantifiably Assured-Microelectronics Pipeline*	0.000	0.000	90.218	16.700	-	16.700	-	-	-	-	-	-

Note

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)” were realigned under four new project codes to correctly align PE funding in support of the Quantifiable Assurance method 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 -

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604294D8Z / *Trusted and Assured Microelectronics*

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 were 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.

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.

This PE supports the OUSD(R&E) Microelectronics Modernization Roadmap. The primary areas of focus of this roadmap include the following: access to state-of-the-art microelectronics technology, access to advanced packaging and test; access to the best commercial design technology; quantifiable assurance and secure design; foundry access; 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; education and workforce development; 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.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604294D8Z / *Trusted and Assured Microelectronics*

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	547.421	489.076	519.140	-	519.140
Current President's Budget	534.340	503.750	509.195	-	509.195
Total Adjustments	-13.081	14.674	-9.945	-	-9.945
• Congressional General Reductions	-	-0.326			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	15.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-12.987	-			
• Program Adjustment	-	-	-9.945	-	-9.945
• Cancelled Account Reduction	-0.094	-	-	-	-

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2020	FY 2021
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: 912: *Create a Quantifiably Assured-Microelectronics Pipeline*		
Congressional Add: *Trusted Artificial Intelligence*	-	5.000
Congressional Add Subtotals for Project: 912	-	5.000
Congressional Add Totals for all Projects	5.000	5.000

Change Summary Explanation

In FY 2021 Program Element (PE) funding for 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)" were realigned under four new project codes to correctly align PE funding in support of the Quantifiable Assurance method 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 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.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604294D8Z / *Trusted and Assured Microelectronics*	Project (Number/Name) 291 / *Joint Federated Assurance Center*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
291: *Joint Federated Assurance Center*	12.000	5.887	0.000	0.000	-	0.000	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In FY 2021 Program Element (PE) funding for Project 291 – “Joint Federated Assurance Center”, was realigned under new project code, P907 - "Access to State-of-the-Art (SOTA) Microelectronics - Development", to correctly align PE funding in support of a zero-trust philosophy and reflective of current priorities.

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 2020	FY 2021	FY 2022
Title: Joint Federated Assurance Center (JFAC)	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.			
Accomplishments/Planned Programs Subtotals	5.887	-	-

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
• O&M (CIVPAY): *0303140D8Z*	1.113	-	-	-	-	-	-	-	-	-	-

Remarks

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604294D8Z / *Trusted and Assured Microelectronics*	Project (Number/Name) 291 / *Joint Federated Assurance Center*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Joint Federated Assurance Center	MIPR	Army, Navy, Air Force : Various	12.000	5.887	Jan 2020	-		-		-		-	Continuing	Continuing	2.000
		Subtotal	12.000	5.887		-		-		-		-	Continuing	Continuing	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	12.000	5.887		0.000		-		-		-	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 291 / *Joint Federated Assurance Center*

	FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025				FY 2026			
	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 Federated Assurance Center																												
Mature JFAC tools, technology and talent capabilities and capacity	[redacted]																											
Maintain infrastructure services and staff	[redacted]																											
Incorporate science and technology, advanced technology solutions into the JFAC website	[redacted]																											
Develop best practices, and relationships with industry	[redacted]																											

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 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 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604294D8Z / *Trusted and Assured Microelectronics*	Project (Number/Name) 645 / *Verification & Validation (V&V) Capabilities and Standards for Trust*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
645: *Verification & Validation (V&V) Capabilities and Standards for Trust*	188.836	39.117	0.000	0.000	-	0.000	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In FY 2021, Project Code (Pcode) 645 funds transferred from this Pcode to two new Pcodes for “P907 - Access to SOTA Microelectronics” and “P912 - 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.

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.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 645 / *Verification & Validation (V&V) Capabilities and Standards for Trust*

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 2020	FY 2021	FY 2022
Title: Verification & Validation (V&V) Capabilities and Standards for Trust	34.117	-	-
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.			
Accomplishments/Planned Programs Subtotals	34.117	-	-

	FY 2020	FY 2021
Congressional Add: Supply Chain Risk Management	5.000	-
FY 2020 Accomplishments: • Aligned 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). • Established and conducted pilot activities with programs for supply chain risk assessment on components and boards utilizing advanced analytics and public and private financial data.		
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 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604294D8Z / *Trusted and Assured Microelectronics*	Project (Number/Name) 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 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 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	188.836	39.117	Mar 2020	-		-		-		-	Continuing	Continuing	-
		Subtotal	188.836	39.117		-		-		-		-	Continuing	Continuing	N/A

Remarks

N/A

	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	188.836	39.117		0.000		-		-		-	Continuing	Continuing	N/A

Remarks

NA

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 645 / *Verification & Validation (V&V) Capabilities and Standards for Trust*

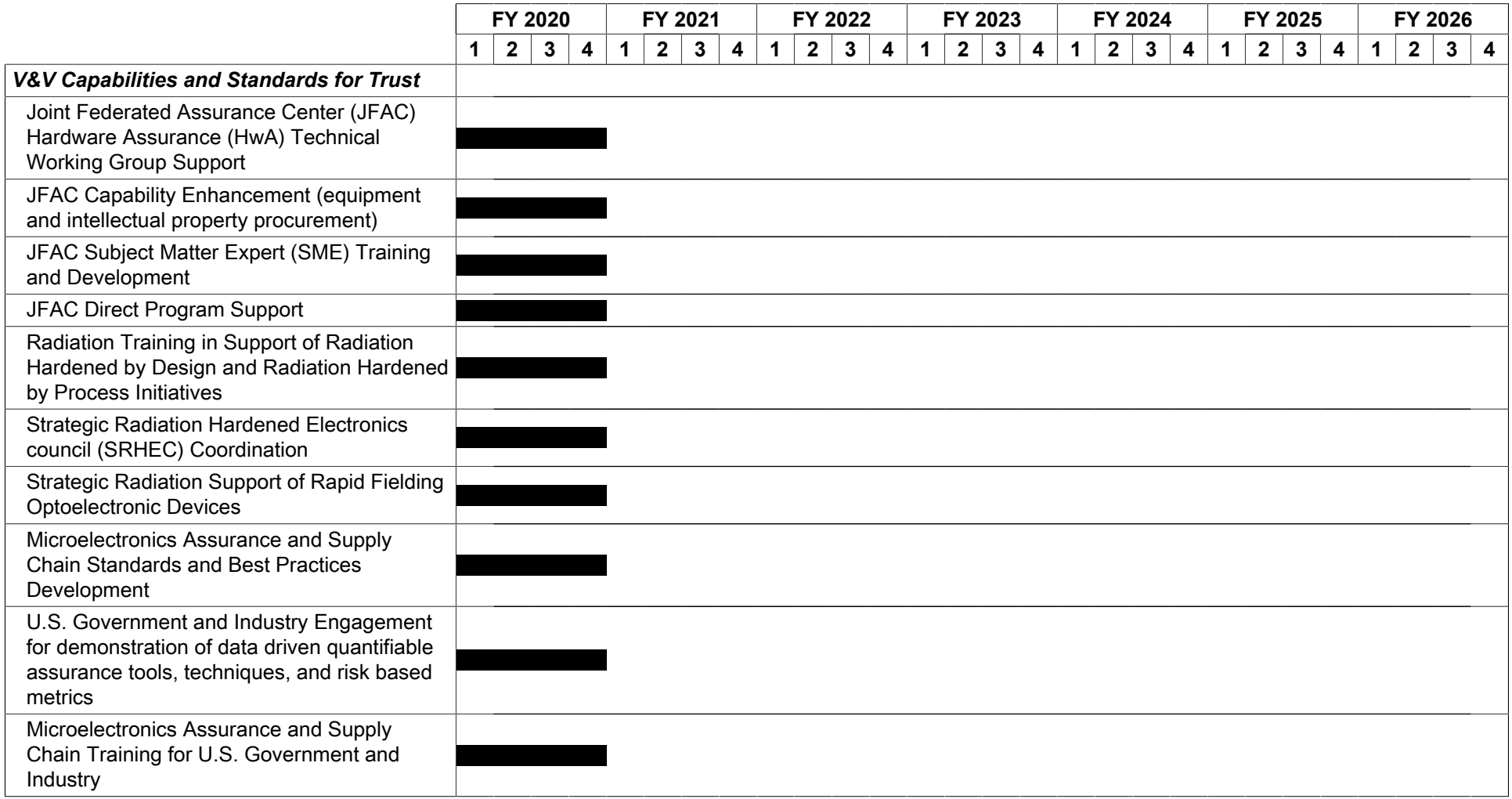


Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 645 / *Verification & Validation (V&V) Capabilities and Standards for Trust*

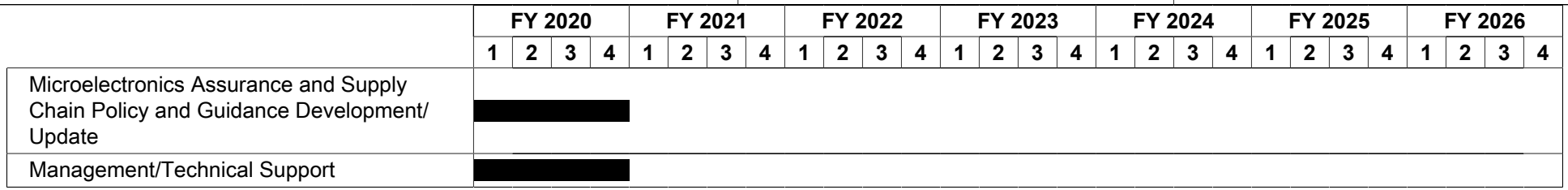


Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 645 / *Verification & Validation (V&V) Capabilities 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 2022 Office of the Secretary Of Defense											Date: May 2021	
Appropriation/Budget Activity 0400 / 4					R-1 Program Element (Number/Name) PE 0604294D8Z / *Trusted and Assured Microelectronics*				Project (Number/Name) 646 / *New Trust Approach Development*			
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
646: *New Trust Approach Development*	40.023	38.247	0.000	0.000	-	0.000	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In FY 2021, Project Code (Pcode) 646 funds transferred from this Pcode to the new Pcodes for "P907 - 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.

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.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 646 / *New Trust Approach Development*

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.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: New Trust Approach Development	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. 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.			
Accomplishments/Planned Programs Subtotals	38.247	-	-

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 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604294D8Z / *Trusted and Assured Microelectronics*	Project (Number/Name) 646 / *New Trust Approach Development*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 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	40.023	38.247	Mar 2020	-		-		-		-	Continuing	Continuing	-
		Subtotal	40.023	38.247		-		-		-		-	Continuing	Continuing	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	40.023	38.247		0.000		-		-		-	Continuing	Continuing	N/A

Remarks

NA

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 646 / *New Trust Approach Development*

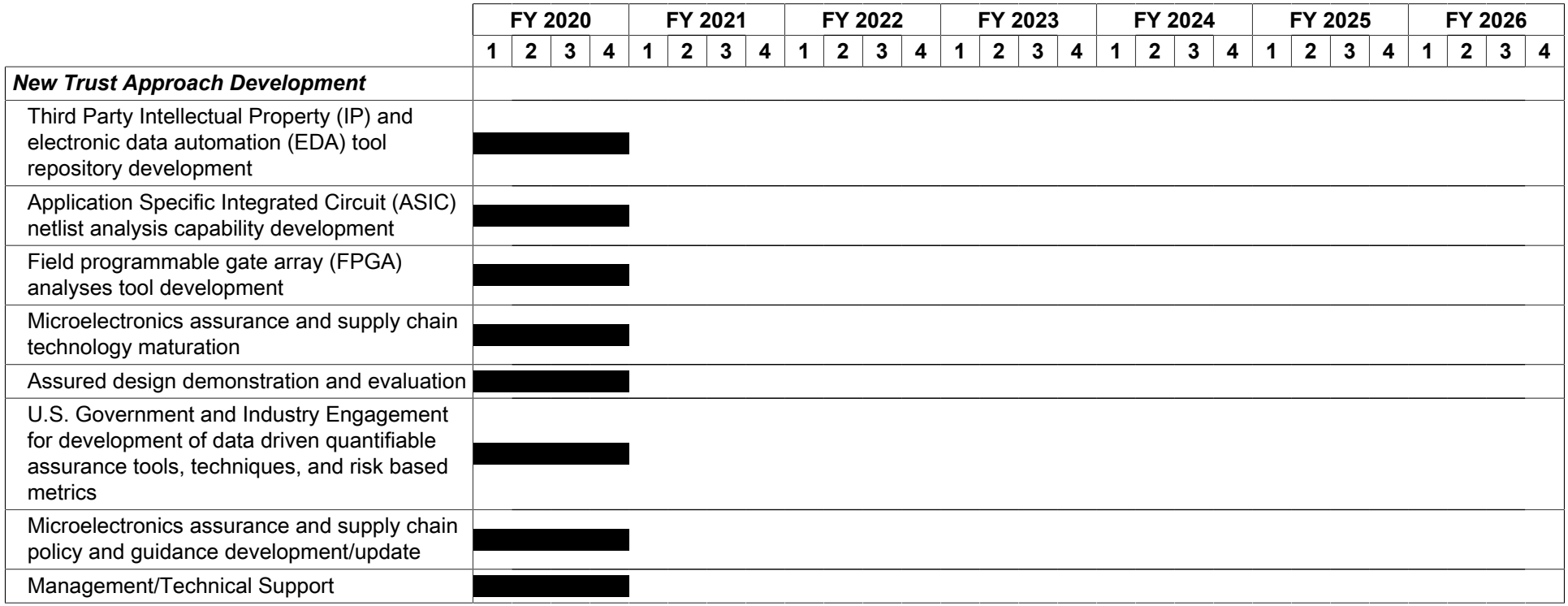


Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 646 / *New Trust Approach Development*

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 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604294D8Z / *Trusted and Assured Microelectronics*	Project (Number/Name) 647 / *Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) Innovation and Development*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
647: *Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) Innovation and Development*	423.978	451.089	0.000	0.000	-	0.000	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Funds transferred from this Project code (Pcode) Pcode to new Pcodes for “P907 - Access to State-of-the-Art (SOTA) Microelectronics Development”, “P908 - Access to Advanced Packaging and Test Development”, “P911 - Address DoD Unique Needs Especially Radiation Hardening”, and “P912 - 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 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.

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;

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 647 / *Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) Innovation and Development*

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
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 2020	FY 2021	FY 2022
Title: Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) ***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.	451.089	-	-
Accomplishments/Planned Programs Subtotals	451.089	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 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 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 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	451.089	Mar 2020	-		-		-		-	Continuing	Continuing	-
		Subtotal	423.978	451.089		-		-		-		-	Continuing	Continuing	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	423.978	451.089		0.000		-		-		-	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 647 / *Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) Innovation and Development*

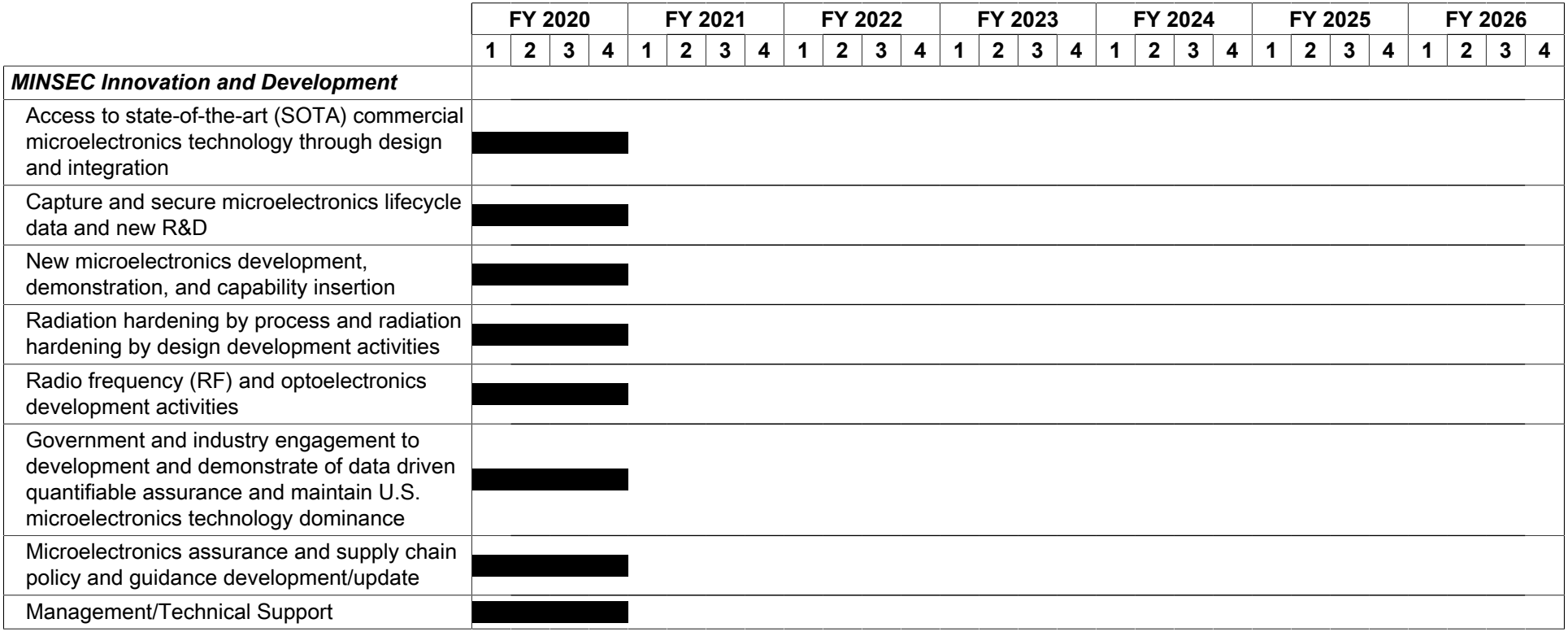


Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 647 / *Microelectronics Innovation for National 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 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604294D8Z / *Trusted and Assured Microelectronics*	Project (Number/Name) 907 / *Access to State-of-the-Art (SOTA) Microelectronics - Development*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
907: *Access to State-of-the-Art (SOTA) Microelectronics - Development*	0.000	0.000	281.594	297.195	-	297.195	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

In 2021, this project incorporated 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 2020	FY 2021	FY 2022
Title: Joint Federated Assurance Center (JFAC)	-	8.810	9.000
Description: This project's activities will enhance the use of hardware and software tools, techniques, and assurance methodology directly with programs and organizations, throughout DoD and the life cycle. JFAC provides a common forum in DoD for assurance best practices, training, community dialog on assurance, access to new technology, collaboration with other components of USG, and tools usable by programs for maintaining quantifiable assurance data.			
FY 2021 Plans: • 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 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 907 / *Access to State-of-the-Art (SOTA) Microelectronics - Development*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
• Conduct rapid acquisition pilots for enterprise procurement SwA and HwA tool enterprise license procurement models. • Expand JFAC infrastructure to deploy tools & capabilities. • Develop and distribute high priority acquisition workforce program and technical implementation guidance and training packages. ***FY 2022 Plans:*** • Select and procure quantities of state-of-the-art software assurance (SwA) tools; innovate and advance technology for vulnerability and subverted code detection of binary code in DoD embedded systems; evaluate high payoff open source components required to move DoD systems to the cloud using containers; technology and infrastructure support to programs to determine and mitigate exploitable vulnerabilities; map vulnerabilities and threats to SwA tool capabilities and provide assessments of how well SwA tools and techniques function directly to programs. • Execute enterprise license program procurement of SwA tools. • Continue expanding JFAC infrastructure to support hardware assurance, deploy SwA tools, training, shared experiences, and best tool-use practice directly to programs and organizations via the JFAC website (https://jfac.navy.mil). • Develop and make directly available to programs and organizations beyond leading edge acquisition workforce program and technical implementation guidance, training packages, and subject matter experts for quantifiable assurance. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Small changes reflect budget fluctuations.			
Title: Design ***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. Successful implementation will continue to transition these technologies to use in DoD programs and maintain access to multiple (2) commercial microelectronics facilities, and solidify a data-driven approach to supply chain protection. ***FY 2021 Plans:*** Planned activities are as follows: • Establish vetted IP and electronic data automation (EDA) Repository, which is available for DoD use, and distribute assured tools via cloud services. • Enhance secure design and cloud capability with new tools/techniques.	-	42.625	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 907 / *Access to State-of-the-Art (SOTA) Microelectronics - Development*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
• Enable data management and analysis for lifecycle microelectronics assurance. ***FY 2022 Plans:*** These efforts are being merged into a combined program for both secure design and quantifiable assurance activities beginning with FY 2022. See “Secure Design and Quantifiable Assurance Development” program below. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** These efforts are being merged into a combined program for both secure design and quantifiable assurance activities beginning with FY 2022. See “Secure Design and Quantifiable Assurance Development” program below.			
Title: Foundry ***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 and enable regular dedicated and multi-project wafer runs with fabrication data products. 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 life cycle, thereby mitigating risk. ***FY 2021 Plans:*** Planned activities are as follows: • Pilot assured access to multiple SOTA domestic fabrication sources. • Continued build-out of secured design environments and persistent expertise. ***FY 2022 Plans:*** Planned activities are as follows: • Enhance access to SOTA fabrication ecosystem. • Develop program of record access to assured fabrication flow at multiple SOTA domestic sources. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Changes reflect minor budget fluctuations.	-	44.338	45.000
Title: Secure Design and Quantifiable Assurance Development ***Description:*** This activity includes verifying the ability to fabricate classified and/or export-controlled designs in on-shore commercial foundries and quantify integrity of designs and end products to include authentication and identification– 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.	-	185.821	243.195

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 907 / *Access to State-of-the-Art (SOTA) Microelectronics - Development*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
The project will continue to develop the technical means for protecting intellectual property (IP) and obfuscating the final user function from the supply chain. This result 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. ***FY 2021 Plans:*** Planned activities are as follows: • 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). • Improved logical and functional nondestructive analysis for SOTA field programmable gate arrays (FPGAs), System on Chips (SoCs), and ASICs. • Increased throughput and decreased data collection time for destructive physical analysis and inspection at SOTA. • Acquire verification equipment to compare measured test data to design information. • Scale simulation and emulation environment to compare design tool and IP artifacts to measure data. • 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. • Conduct mathematical model-based risk assessment for design, fabrication and packaging. ***FY 2022 Plans:*** Planned activities are as follows: • Continue to enhance secure design and cloud capability with new tools/techniques. • Utilize traceability and provenance mechanisms to verify and vet data sources in a zero-trust architecture and enhance ability of DoD/Defense Industrial Base to design SOTA microelectronics. • Quantify transition of designs to prototypes and programs of record and maintain persistence in lifecycle assurance data and intellectual property. • Instantiate authentication and protection workflows for design assurance. • 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. • 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.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 907 / *Access to State-of-the-Art (SOTA) Microelectronics - Development*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
• Align program to provide persistent expertise delivery for application specific risk; compare design features to enhance verification and validation. • Develop a scalable classification system for design and verification ecosystem. • Analyze quantitative assurance data from pilot risk assessment demonstration. • 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. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Changes reflect the combination of secure design efforts into these quantifiable assurance efforts. These efforts will deliver secure design capability concurrently with quantifiable assurance for the prototypes developed.			
Accomplishments/Planned Programs Subtotals	-	281.594	297.195

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604294D8Z / *Trusted and Assured Microelectronics*	Project (Number/Name) 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 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 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	297.195	Mar 2022	-		297.195	Continuing	Continuing	-
		Subtotal	-	-		281.594		297.195		-		297.195	Continuing	Continuing	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		281.594		297.195		-		297.195	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 907 / *Access to State-of-the-Art (SOTA) Microelectronics - Development*

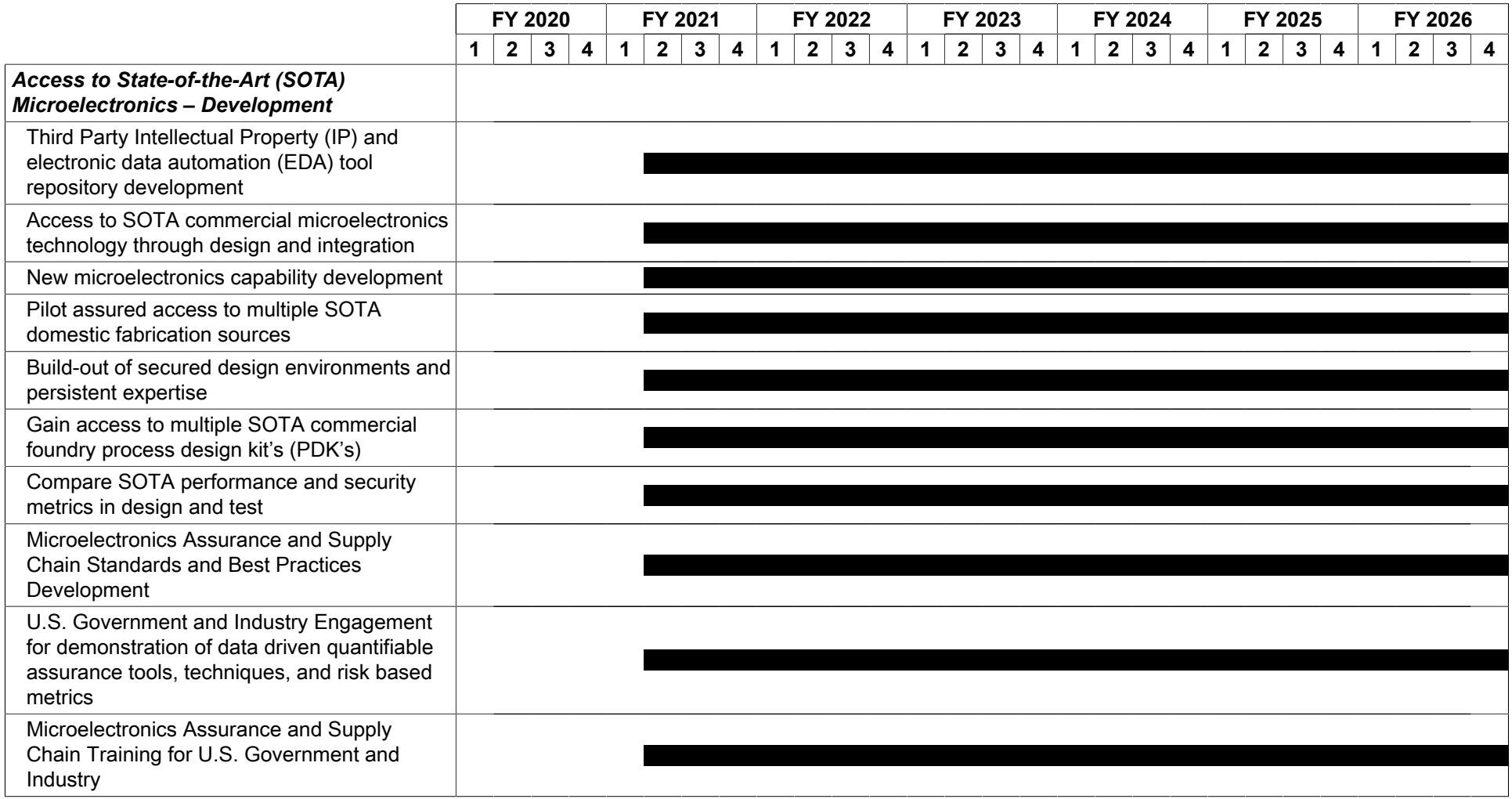


Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 907 / *Access to State-of-the-Art (SOTA) Microelectronics - Development*

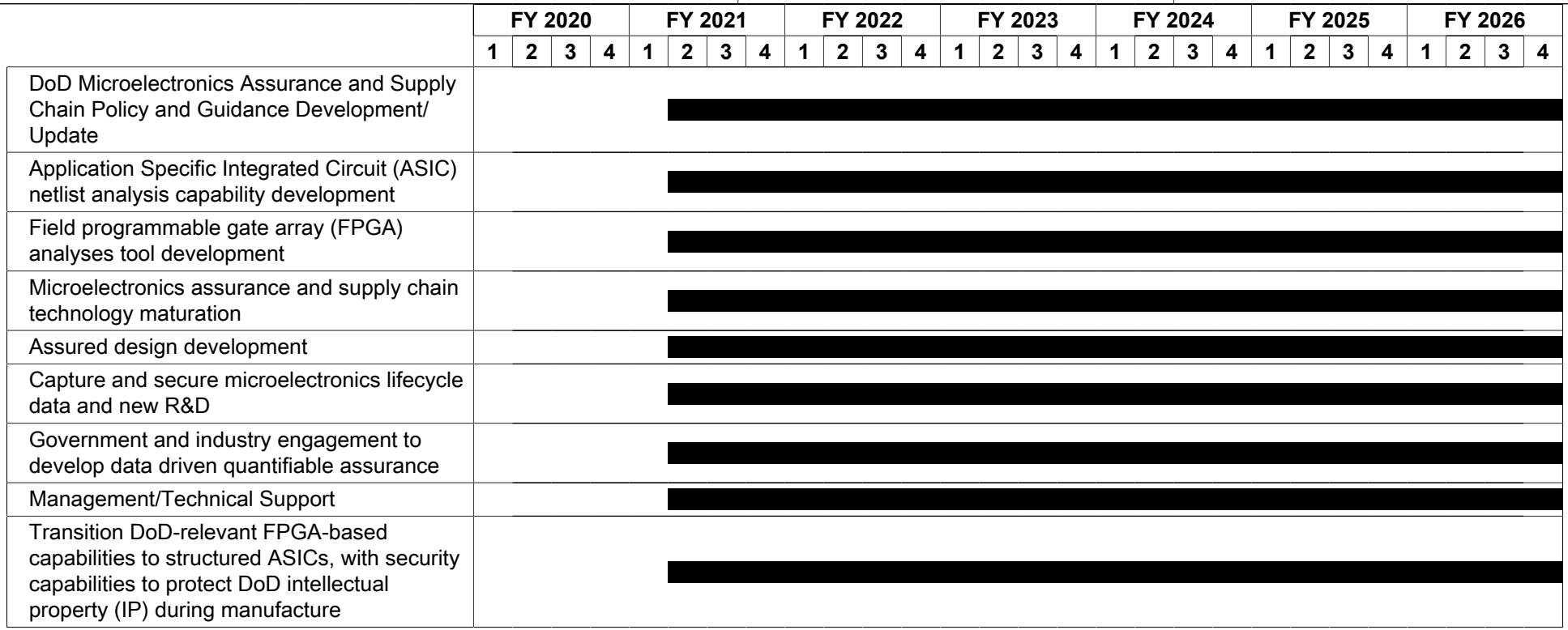


Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 907 / *Access to State-of-the-Art (SOTA) Microelectronics - 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	2026
Access to SOTA commercial microelectronics technology through design and integration	2	2021	4	2026
New microelectronics capability development	2	2021	4	2026
Pilot assured access to multiple SOTA domestic fabrication sources	2	2021	4	2026
Build-out of secured design environments and persistent expertise	2	2021	4	2026
Gain access to multiple SOTA commercial foundry process design kit’s (PDK’s)	2	2021	4	2026
Compare SOTA performance and security metrics in design and test	2	2021	4	2026
Microelectronics Assurance and Supply Chain Standards and Best Practices Development	2	2021	4	2026
U.S. Government and Industry Engagement for demonstration of data driven quantifiable assurance tools, techniques, and risk based metrics	2	2021	4	2026
Microelectronics Assurance and Supply Chain Training for U.S. Government and Industry	2	2021	4	2026
DoD Microelectronics Assurance and Supply Chain Policy and Guidance Development/Update	2	2021	4	2026
Application Specific Integrated Circuit (ASIC) netlist analysis capability development	2	2021	4	2026
Field programmable gate array (FPGA) analyses tool development	2	2021	4	2026
Microelectronics assurance and supply chain technology maturation	2	2021	4	2026
Assured design development	2	2021	4	2026
Capture and secure microelectronics lifecycle data and new R&D	2	2021	4	2026
Government and industry engagement to develop data driven quantifiable assurance	2	2021	4	2026

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 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	2026
Transition DoD-relevant FPGA-based capabilities to structured ASICs, with security capabilities to protect DoD intellectual property (IP) during manufacture	2	2021	4	2026

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604294D8Z / *Trusted and Assured Microelectronics*	Project (Number/Name) 908 / *Access to Advanced Packaging and Testing - Development*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
908: *Access to Advanced Packaging and Testing - Development*	0.000	0.000	81.438	112.600	-	112.600	-	-	-	-	-	-
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 2020	FY 2021	FY 2022
Title: Access to Advanced Packaging and Testing - Development	-	81.438	112.600

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.

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).

FY 2021 Plans:

Planned activities are as follows:

- Enhance secure design and packaging capability with new tools/techniques.
- Qualify advanced heterogeneous packaging technology.
- Continued development of secure, accessible, and cost effective SOTA heterogeneous integration design, assembly and test capability.
- Develop prototype designs for SOTA Digital and radio frequency microelectronics applications.

FY 2022 Plans:

Planned activities are as follows:

- Enhance secure design and packaging capability with new tools/techniques.
- Continued development of secure, accessible, and cost effective SOTA heterogeneous integration design, assembly and test capability.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 908 / *Access to Advanced Packaging and Testing - Development*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
• Establish a SOTA prototype packaging secure assembly and test source for SOTA digital and RF applications. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Funding will increase from $81.438 million to $112.600 million in order to begin to deliver proto-type designs and hardware for accelerating program adoption and for qualification, and establish infrastructure and process that supports ITAR/EAR, proprietary and security requirements.			
Accomplishments/Planned Programs Subtotals	-	81.438	112.600

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 908 / *Access to Advanced Packaging and Testing - Development*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 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	112.600	Mar 2022	-		112.600	Continuing	Continuing	-
		Subtotal	-	-		81.438		112.600		-		112.600	Continuing	Continuing	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		81.438		112.600		-		112.600	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 908 / *Access to Advanced Packaging and Testing - Development*

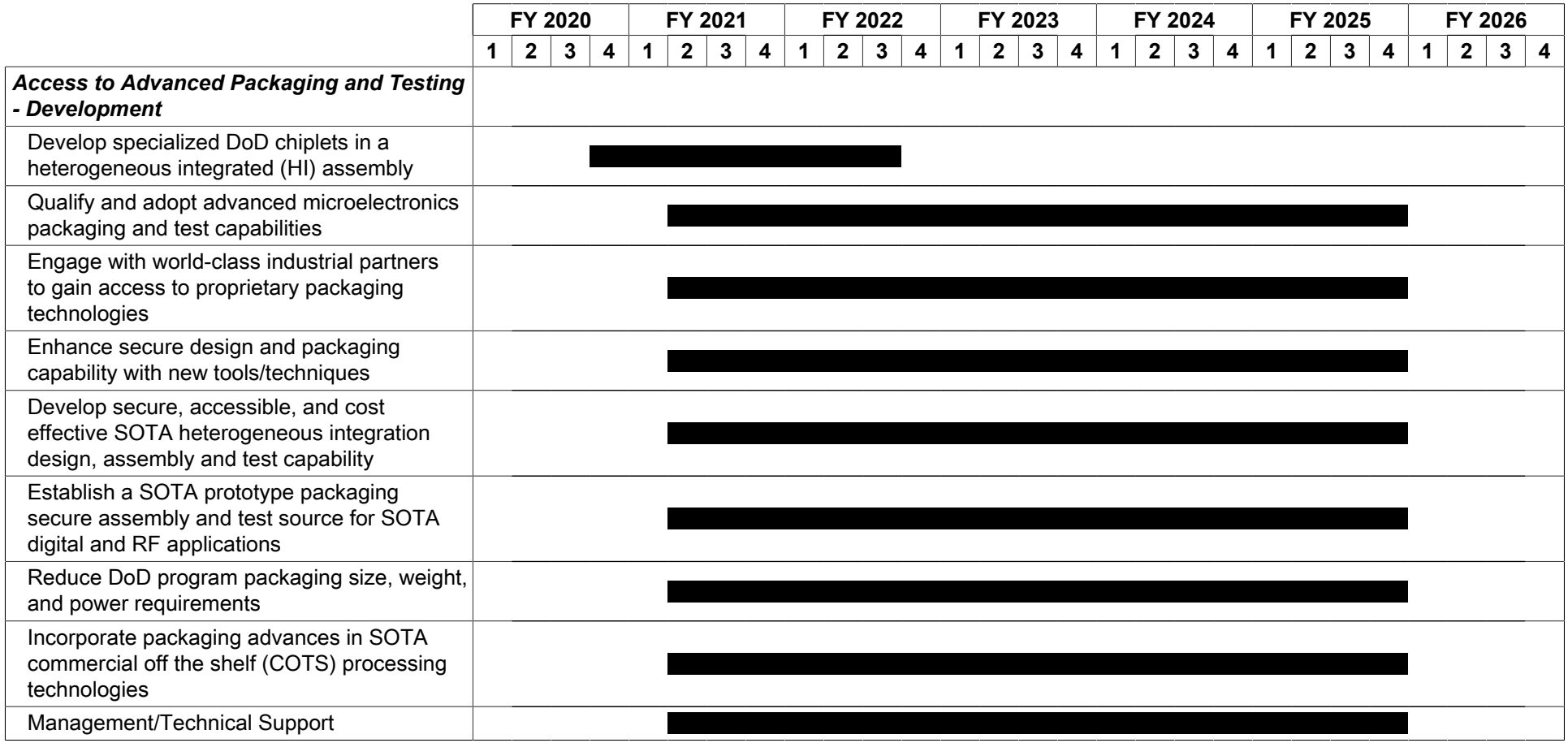


Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 908 / *Access to Advanced Packaging and Testing - Development*

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 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604294D8Z / *Trusted and Assured Microelectronics*	Project (Number/Name) 911 / *Address DoD Unique Needs - Radiation Hardening and non-CMOS*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
911: *Address DoD Unique Needs - Radiation Hardening and non-CMOS*	0.000	0.000	50.500	82.700	-	82.700	-	-	-	-	-	-
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 2020	FY 2021	FY 2022
Title: Address DoD Unique Needs Especially Radiation Hardening - Development	-	50.500	82.700
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). 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. ***FY 2021 Plans:*** Planned activities are as follows: • Establish assurance foundations for radio frequency (RF) designs.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 911 / *Address DoD Unique Needs - Radiation Hardening and non-CMOS*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
• Establish foundations of assurance for RF applications; deliverables include expansion into other discipline areas: RF, optoelectronic (OE), and Additive Manufacturing. • Continue to qualify sources for radiation hardened (RH) electronics to transition developed radiation hardened capabilities. • Qualify strategic RH sources; develop RH memories and system on chip; develop Radiation Hardened By Design (RHBD) techniques to meet strategic radiation environmental requirements utilizing SOTA technology nodes; develop additional sources for digital Radiation Hardened By Process (RHBP) capability. • Deliverables: Develop strategic RHBD techniques in at least 2 SOTA technologies with validated PDKs. • Major Milestone: Establish 2nd source for strategic RHBP state-of-the-practice (SOTP) fully depleted silicon on insulator source in support of nuclear modernization. • Develop new, SOTP and SOTA, sources (foundry process) for radiation hardened microelectronics. • 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. • 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. • 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. • Develop enhanced materials, devices, and modules for RFOE devices. • Collaborate to establish and enhance domestic SOTA RFOE foundry capabilities. ***FY 2022 Plans:*** Planned activities are as follows: • Continue development of RHBD techniques in SOTA technologies with validated PDKs • Transition developed RH technologies into space and strategic programs. • Host secure design challenges to optimize SOTA RFOE IP and test articles for frequency, bandwidth, efficiency, power, etc. • Mature Gallium Nitride and Silicon Carbide substrate source offerings. • Continue development of RF and OE microelectronics using secured design environments and optimized SOTA IP. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Changes reflect increased emphasis within the department on the urgent need for SOTP and SOTA radiation hardened microelectronics.			
Accomplishments/Planned Programs Subtotals	-	50.500	82.700

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 911 / *Address DoD Unique Needs - Radiation Hardening and non-CMOS*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 911 / *Address DoD Unique Needs - Radiation Hardening and non-CMOS*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 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	82.700	Mar 2022	-		82.700	Continuing	Continuing	-
		Subtotal	-	-		50.500		82.700		-		82.700	Continuing	Continuing	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		50.500		82.700		-		82.700	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 911 / *Address DoD Unique Needs - Radiation Hardening and non-CMOS*

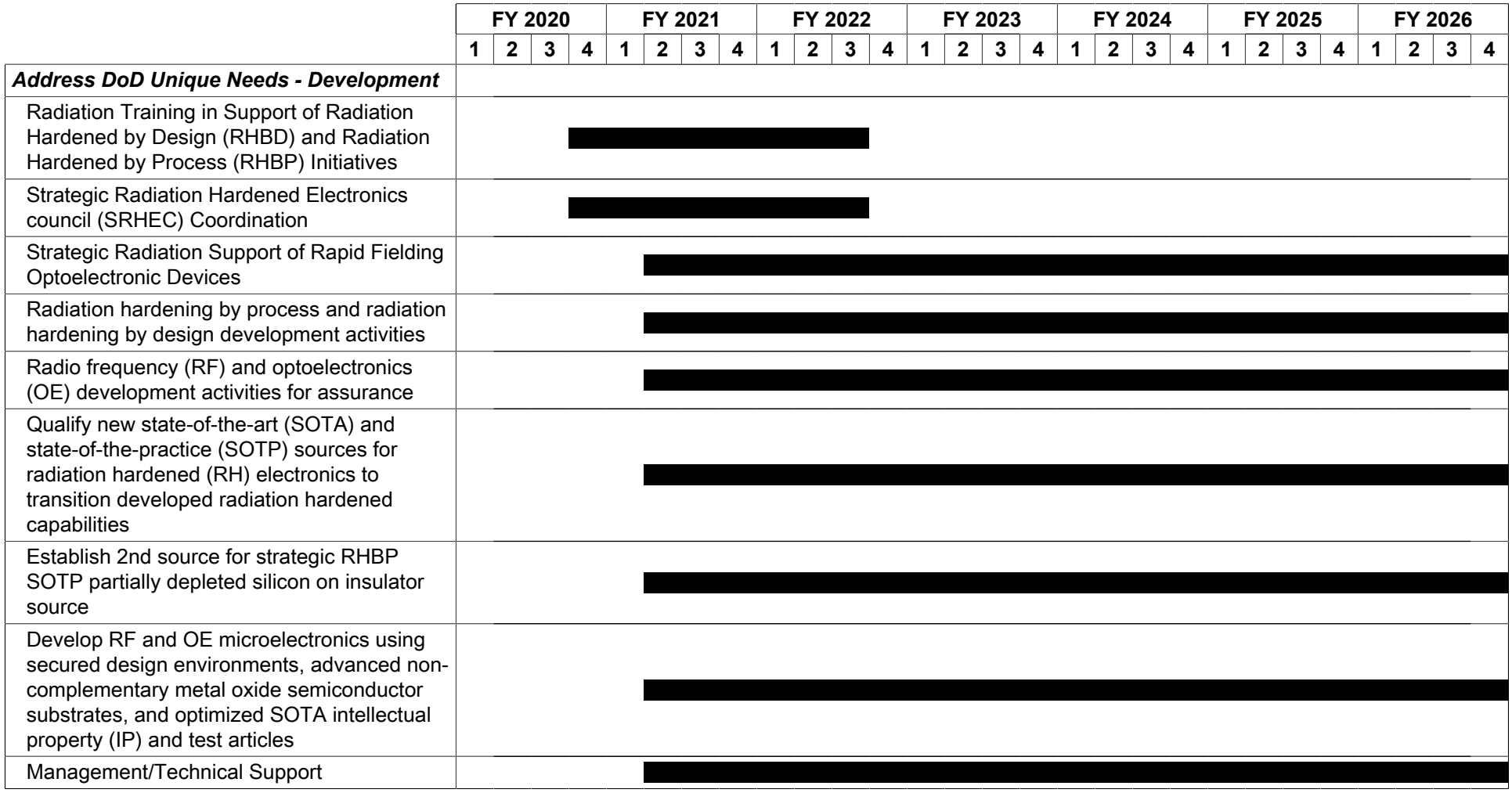


Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 911 / *Address DoD Unique Needs - Radiation Hardening and non-CMOS*

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	2026
Radiation hardening by process and radiation hardening by design development activities	2	2021	4	2026
Radio frequency (RF) and optoelectronics (OE) development activities for assurance	2	2021	4	2026
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	2026
Establish 2nd source for strategic RHBP SOTP partially depleted silicon on insulator source	2	2021	4	2026
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	2026
Management/Technical Support	2	2021	4	2026

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604294D8Z / *Trusted and Assured Microelectronics*	Project (Number/Name) 912 / *Create a Quantifiably Assured-Microelectronics Pipeline*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
912: *Create a Quantifiably Assured-Microelectronics Pipeline*	0.000	0.000	90.218	16.700	-	16.700	-	-	-	-	-	-
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 2020	FY 2021	FY 2022
Title: Create a Resilient and Robust Microelectronics Pipeline - Development	-	85.218	16.700
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. 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. 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.			
FY 2021 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 912 / *Create a Quantifiably Assured-Microelectronics Pipeline*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Planned activities are as follows: • Align stakeholder prototype demonstrators using assurance enabled SOTA fabrication. • Prototype modernization of existing systems with state of the art fabrication technologies with enhanced assurance techniques. • Continue established industry partnerships for assured technology co-development and prototype development. Perform modernization prototype demonstrations with DoD acquisition programs. • Demonstrate limited defensive measures for the protection of commercial wireless systems. • Initiate development of a tactical radio prototype, leveraging commercial and DoD-developed hardware and software. • Lower barriers to innovation (e.g. tools, IP, test capability) and 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]. • Demonstrate advanced negative capacitance non-volatile memory devices, supporting the growing energy-efficient computational needs for many DoD applications. • Establish expertise, develop workforce and training ecosystems with academia, and build close connections within the U.S. Semiconductor industry to identify, report on, and mitigate supply chain threats. • Development of tools to trace parts through their supply chain and track the health of the U.S. semiconductor segments. ***FY 2022 Plans:*** • Development of DoD program relevant application prototypes. • Foster education and workforce development to include Industry-University Cooperative Research Centers Program (IUCRC) models with the National Science Foundation (NSF) and other partners. • Execute radiation hardened, heterogeneous integration/advanced packaging, and System On A Chip design Public-Private-Academic Partnership (PPAP) Models. Develop Supply Chain PPAP model. Expand PPAP partners and collaborators. • Stimulate rapid maturation and transition of emerging technologies and co-development with industry for assurance and security. • Continue to lower the barriers (e.g. cost, expertise, access) to microelectronics innovation for startups and small businesses. • Continue development of industry outreach strategy to address critical technologies identified by DoD assurance and intelligence analysis. Sharing developed technical threat information with industry partners. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Changes reflect reallocation of funds from this project to Advanced Packaging and Radiation Hardened microelectronics efforts.			
Accomplishments/Planned Programs Subtotals	-	85.218	16.700

	FY 2020	FY 2021
Congressional Add: Trusted Artificial Intelligence	-	5.000

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 912 / *Create a Quantifiably Assured-Microelectronics Pipeline*

	FY 2020	FY 2021
FY 2021 Plans: Develop the Trusted AI Consortium and Public-Private-Academic Partnership (PPAP) Model through five Graduate Research Projects across three Universities.		
Congressional Adds Subtotals	-	5.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 912 / *Create a Quantifiably Assured-Microelectronics Pipeline*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 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	-	-		90.218	Mar 2021	16.700	Mar 2022	-		16.700	Continuing	Continuing	-
		Subtotal	-	-		90.218		16.700		-		16.700	Continuing	Continuing	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		90.218		16.700		-		16.700	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 912 / *Create a Quantifiably Assured-Microelectronics Pipeline*

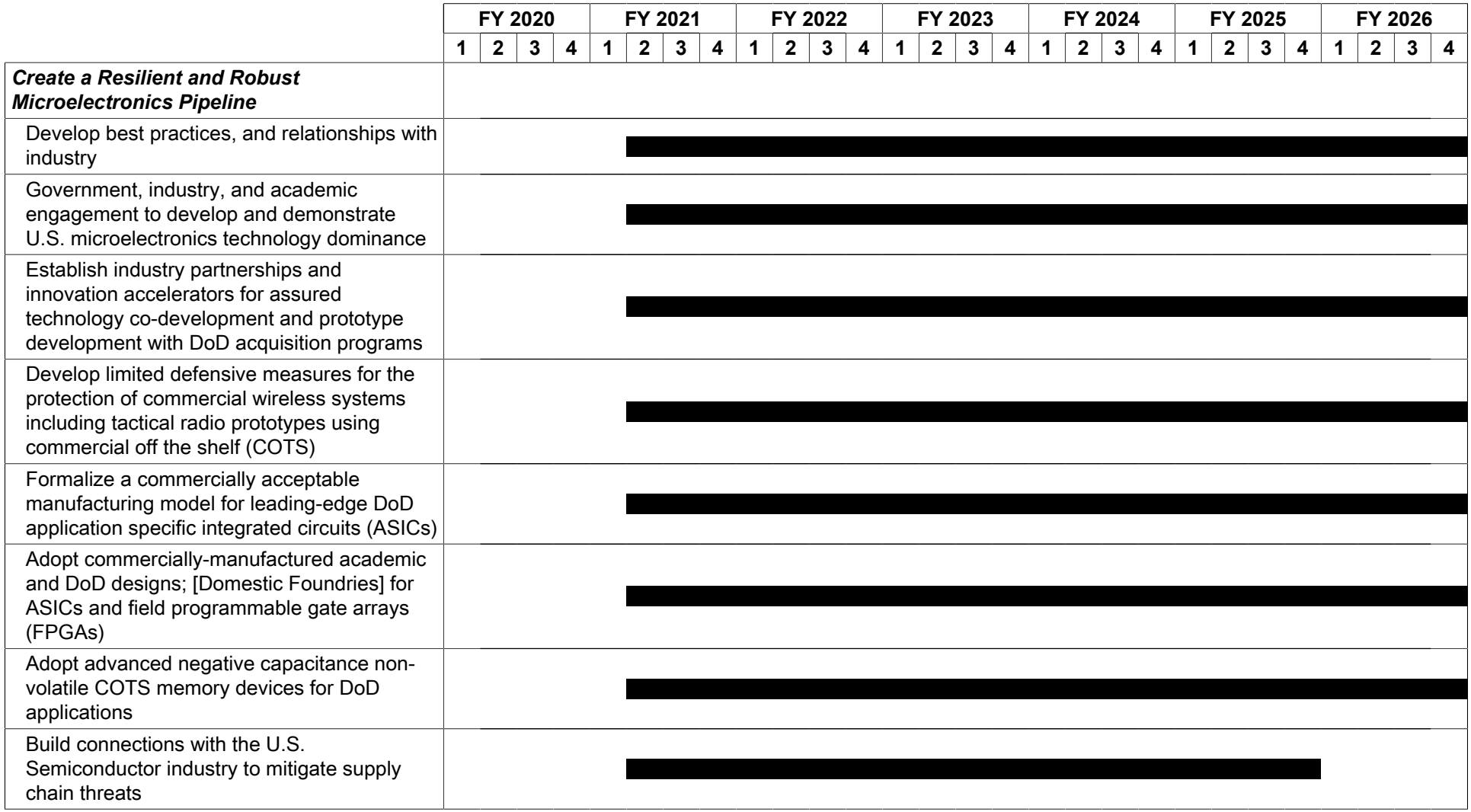


Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 912 / *Create a Quantifiably Assured-Microelectronics Pipeline*

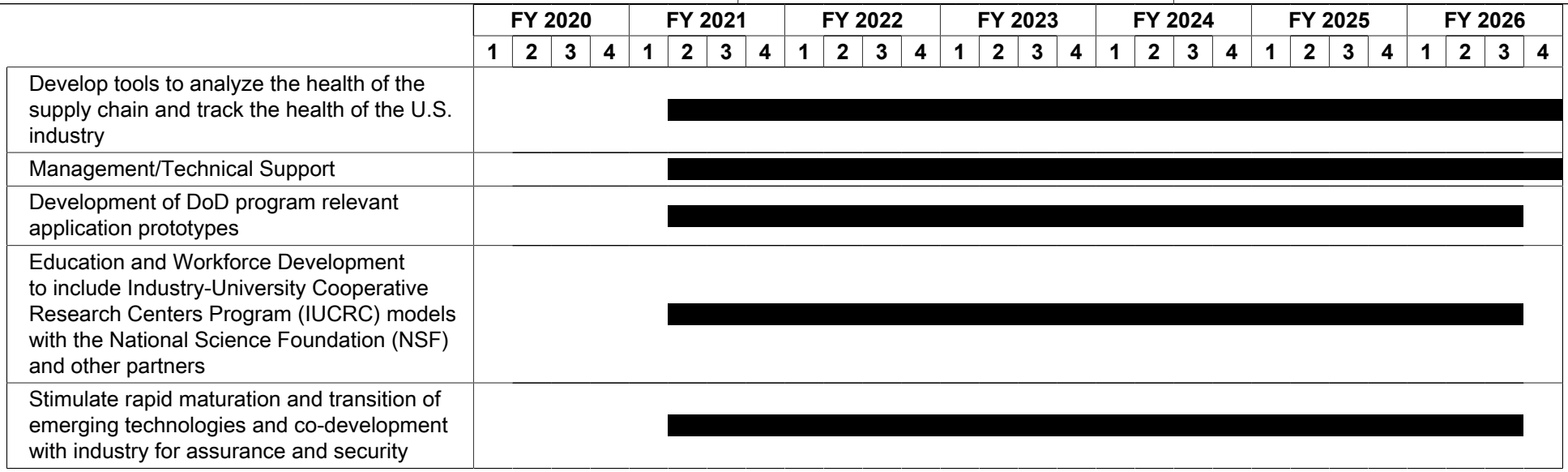


Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 912 / *Create a Quantifiably Assured-Microelectronics 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	2026
Government, industry, and academic engagement to develop and demonstrate U.S. microelectronics technology dominance	2	2021	4	2026
Establish industry partnerships and innovation accelerators for assured technology co-development and prototype development with DoD acquisition programs	2	2021	4	2026
Develop limited defensive measures for the protection of commercial wireless systems including tactical radio prototypes using commercial off the shelf (COTS)	2	2021	4	2026
Formalize a commercially acceptable manufacturing model for leading-edge DoD application specific integrated circuits (ASICs)	2	2021	4	2026
Adopt commercially-manufactured academic and DoD designs; [Domestic Foundries] for ASICs and field programmable gate arrays (FPGAs)	2	2021	4	2026
Adopt advanced negative capacitance non-volatile COTS memory devices for DoD applications	2	2021	4	2026
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	2026
Management/Technical Support	2	2021	4	2026
Development of DoD program relevant application prototypes	2	2021	3	2026
Education and Workforce Development to include Industry-University Cooperative Research Centers Program (IUCRC) models with the National Science Foundation (NSF) and other partners	2	2021	3	2026
Stimulate rapid maturation and transition of emerging technologies and co-development with industry for assurance and security	2	2021	3	2026

THIS PAGE INTENTIONALLY LEFT BLANK

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604331D8Z / *Rapid Prototyping Program*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	243.180	70.227	92.023	103.575	-	103.575	-	-	-	-	-	-
638: *Rapid Prototyping Program*	243.180	70.227	92.023	103.575	-	103.575	-	-	-	-	-	-

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. RPP addresses priorities identified by the National Defense Strategy, the Department of Defense (DoD) modernization priorities, the emerging Joint Warfighting Concept (JWC) needs, and Service or Agency identified capability gaps. New projects are selected with inputs from the Services and Agencies, the Joint Staff, the Combatant Commands, the Strategic Capabilities Office, the Defense Innovation Unit, and other organizations in order to minimize duplication, synchronize prototyping efforts, and target projects with the widest benefit to the joint warfighter. Overarching program goals include DoD and international (as applicable) modernization of cross-cutting technology areas; enhanced warfighter lethality; providing fieldable end-to-end mission capabilities for Services and Joint application; leveraging international technologies for prototyping and informing programs of record; 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 artificial intelligence / machine learning; autonomous systems; hypersonics; 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 DoD and Service leadership.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	72.351	102.023	104.452	-	104.452
Current President's Budget	70.227	92.023	103.575	-	103.575
Total Adjustments	-2.124	-10.000	-0.877	-	-0.877
• Congressional General Reductions	-	-10.000			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-2.112	-			
• Program Adjustments	-0.012	-	-0.877	-	-0.877

Change Summary Explanation

Fiscal Year 2021 net reduction of $10.000 million is directed by Congress. Fiscal Year 2022 net reduction of $0.877 million to support economic assumption.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604331D8Z / *Rapid Prototyping Program*	Project (Number/Name) 638 / *Rapid Prototyping Program*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
638: *Rapid Prototyping Program*	243.180	70.227	92.023	103.575	-	103.575	-	-	-	-	-	-
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 within 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. In consultation with the Service Science and Technology (S&T) executives, selected projects generally receive a single year of funding to accelerate capability transition to Services' and Agencies' programs of record. Projects deemed to be critical to Modernization by the Under Secretary of Defense for Research and Engineering (USD(R&E)) receive higher amounts of funding across multiple years. 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 2020	FY 2021	FY 2022
Title: High Altitude Long Endurance (HALE) Architecture Technical Demonstration ***Description:*** HALE provided a modular space, stratospheric, air-breathing, and surface based system designed to meet specific mission needs. This system serves as a special communications, full motion video, and tactical system provider out of range of most enemy detection and/or interdiction systems with a large operating envelope. Depending on warfighter requirements, the HALE platform can be modified to fly payloads ranging from Synthetic Aperture Radar (SAR), Electro-optical (EO)/Infra-red (IR) systems, tactical Unmanned Aerial Systems (UAS), communications systems, and tracking systems. The capability was demonstrated at Valiant Shield 20.	4.300	-	-
Title: Stratospheric Intelligence, Reconnaissance, and Surveillance (ISR) Technical Demonstration ***Description:*** The Stratospheric ISR project supported technology development of stratospheric capabilities in order to enable, expedite maturation, and inform transition of U.S. government high-altitude initiatives. This demonstration effort is a leading Department of Defense (DoD) effort to operationalize the stratosphere by offering increased demonstration of high-altitude intelligence, surveillance, and reconnaissance (ISR) and communication systems. The project is focused on the National Defense Strategy principle of "moving at the speed of relevance" for prototyping and experimentation. The project employed small, tactical zero-pressure balloons as well as larger super-pressure balloons while leveraging recent advances made in the commercial sector including sensors and communications links to enable military applications. The effort successfully demonstrated multiple capabilities at Valiant Shield 20.	4.400	-	-
Title: Maritime Prepositioning Squadron (MPSRON) Support to Valiant Shield 20	3.000	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604331D8Z / *Rapid Prototyping Program*	**Project (Number/Name)** 638 / *Rapid Prototyping Program*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Description: This project provided MPSRON support to the Valiant Shield 20 joint exercise to demonstrate the ability to perform intelligence, surveillance, and reconnaissance (ISR) collection against maritime vessels in a contested and degraded environment. MPSRON vessels served as stationary targets in port and moving targets at sea utilizing resilient communications and ISR sensors to impose time constraints on a targeting cycle. MPSRON support to Valiant Shield 20 facilitated demonstration of enhanced lethality prototypes and directly aligns with the National Defense Strategy elements focused on developing creative operational concepts and accelerating the cycle of innovation.			
Title: Naval Surface Warfare Center Port Hueneme Detachment (NSWC PHD) Demonstration Support ***Description:*** This effort provided NSWC PHD - White Sands Missile Range (WSMR) support to Valiant Shield 20. NSWC PHD - WSMR provided support for test events including emitter placement, route planning, and mission execution. This support included the locating and use of a 16-vehicle convoy to include realistic target and support vehicles; location and shipping of threat emitters; global positioning system support from Fort Bliss with towers and drivers; and post-mission data reduction and defined level of situational display during conduct of tests. This funding provided support throughout FY 2020.	5.700	-	-
Title: Distributed Network Resiliency Technical Demonstration ***Description:*** The Distributed Network Resiliency effort demonstrated and provided a resilient aerial network to connect forward based agencies and sensors to ground and maritime command and weapons providing assured command and control in a contested spectrum environment. This effort demonstrated the ability to pass advanced sensor data back to a processing system to be used to provide updates to loitering strike assets. This effort provided data transport over the horizon for platforms across multiple domains and transitioned to the U.S. Navy.	5.672	-	-
Title: Unmanned Systems Technical Demonstration ***Description:*** Unmanned Systems is a Joint Capability Technology Demonstration (PE 0603648D8Z) project that developed autonomous unmanned air systems to accomplish intelligence, surveillance, and reconnaissance (ISR) and electronic warfare (EW) operations n areas inaccessible to manned platforms to find, fix, track, and target mobile targets. In FY 2020, funding from RPP was used to demonstrate the effort in an operational environment, showing EW effects in support of autonomous ISR operations. This effort offers the Combatant Commanders increased operational capacity and resilience by enabling the Joint Force Commander to deliver and adapt effects in dynamic, highly contested areas and support dynamic over-the-horizon targeting concepts. This capability transitioned to a U.S. Marine Corps Program of Record.	4.726	-	-
Title: SCIFIRE ***Description:*** The Southern Cross Integrated Flight Research Experiment (SCIFIRE) is a joint U.S.- Australia (AUS) partnership to develop and demonstrate an air-launched air-breathing hypersonic weapon prototype leveraging previous science and technology	29.200	37.900	45.400

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604331D8Z / *Rapid Prototyping Program*	**Project (Number/Name)** 638 / *Rapid Prototyping Program*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
investments in hypersonics. SCIFIRE will further mature hypersonic cruise missile technologies to engage time-critical, heavily defended, and high-value targets in a contested environment. The SCIFiRE form factor provides enhanced capability by allowing for integration on fighter aircraft. In FY 2020, funding established the Air Force Hypersonic Prototyping Program Office and supported initial prototyping risk reduction activities. ***FY 2021 Plans:*** Continue risk reduction activities, finalize system requirements, and establish Weapons Open System Architecture (WOSA) evaluation criteria. Begin system design efforts and digital system modeling. ***FY 2022 Plans:*** Continue Weapons Open System Architecture (WOSA) implementation, system design efforts for the potential OS alternatives, and digital system modeling. Begin Operational Flight Program (OFP) development, building aircraft integration assets, and wind tunnel testing. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 funding increases as to support prototyping and demonstration prior to transition into Air Force.			
Title: Joint Affordable Kill-Chain Closure (JAKCC)	13.229	30.000	50.000
Description: JAKCC supports the National Defense Strategy's priorities to modernize key capabilities and evolve innovative operational concepts. This effort integrates the fully networked command, control, and communications (FNC3); autonomy; electronic warfare (EW); and intelligence, surveillance, and reconnaissance (ISR) prototypes developed on an autonomous platform. A series of incremental demonstration and experimentation activities are executed in coordination with the Services and Combatant Commands to validate the platform integrated prototype capability to accelerate development and adoption of cost effective and interoperable solutions for defense challenges. The JAKCC project leverages a government reference architecture developed in coordination with the Services and Combatant Commands to enable a Service agnostic prototype acquisition strategy. In coordination with the Services and Combatant Commands, in FY 2020, the JAKCC project developed a Service agnostic prototype acquisition strategy and created a government reference architecture. Additional details are classified. ***FY 2021 Plans:*** In FY 2021, the JAKCC project initiates system engineering and platform system design changes to enable integration of prototype FNC3, EW, and ISR payloads. JAKCC completes system design for FNC3, EW, and ISR payloads and initiates			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604331D8Z / *Rapid Prototyping Program*	**Project (Number/Name)** 638 / *Rapid Prototyping Program*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
prototype development. Additionally, the project completes preliminary planning in coordination with the Services and Combatant Commands and schedules initial technology demonstration for late-FY 2022. ***FY 2022 Plans:*** In FY 2022, the JAKCC project completes prototype payload development. Prototypes undergo testing in laboratory and operationally-relevant conditions prior to integration onto prototype autonomous platforms and the execution of the initial technology demonstration in late-FY 2022. The project begins preliminary planning for a FY 2023 operational demonstration in coordination with the Services and Combatant Commands. JAKCC culminates in a FY 2023 operational demonstration prior to transitioning to multiple Service programs of record for integration. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** In FY 2022, funding increases to complete payload development, platform integration, and demonstration activities.			
Title: Advanced Prototyping to Support DoD Modernization Priorities	-	24.123	8.175
Description: This effort prototypes cutting-edge land, sea, undersea, air, and space capabilities critical to the National Defense Strategy and Modernization priorities and objectives of the Department of Defense (DoD). This effort matures and experiments with operationally representative prototypes of fully networked command, control, and communications; 5G; space; autonomy; hypersonics; cyber; directed energy; bio-technology, and machine learning systems to accelerate development and adoption of cost effective and interoperable solutions for defense challenges. Selected projects demonstrate and deliver mature prototypes to Service programs of record; mitigate risk in DoD programs; and help characterize potential concepts of operations. Advanced prototyping activities seek to rapidly demonstrate capabilities that can help maintain the U.S. technological edge. Demonstration of advanced prototypes will involve partnerships with the Services, industry, academia, and non-traditional DoD partners. ***FY 2021 Plans:*** Projects will be selected in the year of execution to support National Defense Strategy priorities, DoD Modernization priorities, and gaps in the joint Services' investments. Projects will focus on cost-effective, mission-focused efforts to design, mature, and deliver new concepts and technology prototypes aimed at supporting the Joint Force. One to two prototype efforts are anticipated in FY 2021, leveraging Joint, Service, and interagency partnerships. ***FY 2022 Plans:*** Projects will be selected in the year of execution to support National Defense Strategy priorities, DoD Modernization priorities, and gaps in the joint Services' investments. Projects focus on cost-effective, mission-focused efforts to design, mature, and deliver new concepts and technology prototypes aimed at supporting the Joint Force. One to two prototype efforts are anticipated in FY 2021, leveraging Joint, Service, and interagency partnerships. ***FY 2021 to FY 2022 Increase/Decrease Statement:***			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604331D8Z / *Rapid Prototyping Program*	**Project (Number/Name)** 638 / *Rapid Prototyping Program*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
RPP anticipates decreasing funding in this focus area to align funding to high priority USD(R&E) mission prototyping efforts.			
Accomplishments/Planned Programs Subtotals	70.227	92.023	103.575

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 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604331D8Z / *Rapid Prototyping Program*	**Project (Number/Name)** 638 / *Rapid Prototyping Program*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
High Altitude Long Endurance (HALE) Architecture Technical Demonstration	MIPR	U.S. Army : White Sands Missile Range, NM	-	1.699	Jun 2020	-		-		-		-	Continuing	Continuing	-
High Altitude Long Endurance (HALE) Architecture Technical Demonstration	MIPR	Technology Applications Office : Fort Detrick, MD	-	3.101	Jun 2020	-		-		-		-	Continuing	Continuing	-
Stratospheric Intelligence, Reconnaissance, and Surveillance Technical Demonstration	MIPR	U.S. Army CCDC Aviation & Missile Center : Redstone Arsenal	-	2.703	May 2020	-		-		-		-	Continuing	Continuing	-
Stratospheric Intelligence, Reconnaissance, and Surveillance Technical Demonstration	Option/ FFP	Defense Technical Information Center : Fort Belvoir, VA	-	2.197	May 2020	-		-		-		-	Continuing	Continuing	-
Maritime Prepositioning Squadron (MPSRON) Support to Valiant Shield 20	MIPR	Military Sea Lift Command : Norfolk, VA	-	3.500	Aug 2020	-		-		-		-	Continuing	Continuing	-
Naval Surface Warfare Center Port Hueneme Detachment (NSWC PHD) Demonstration Support	MIPR	Naval Surface Warfare Center PORT HUENEME : PORT HUENEME, CA	-	6.200	Aug 2020	-		-		-		-	Continuing	Continuing	-
Distributed Network Resiliency Technical Demonstration	MIPR	Naval Research Laboratory : Washington, DC	-	5.672	Nov 2020	-		-		-		-	Continuing	Continuing	-
Unmanned Systems Technical Demonstration	MIPR	Naval Research Laboratory : Washington, DC	-	4.850	Oct 2020	-		-		-		-	Continuing	Continuing	-
SCIFIRE	Option/ FFP	Defense Technical Information Center : Fort Belvoir, VA	-	0.247	Nov 2020	-		-		-		-	Continuing	Continuing	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604331D8Z / *Rapid Prototyping Program*	**Project (Number/Name)** 638 / *Rapid Prototyping Program*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
SCIFIRE	MIPR	Air Force Life Cycle Management Center : Wright-Patterson Air Force Base, OH	-	1.050	Nov 2020	-		-		-		-	Continuing	Continuing	-
SCIFIRE	C/FP	Johns Hopkins University, Applied Physics Laboratory : Laurel, MD	-	2.319	Nov 2020	-		-		-		-	Continuing	Continuing	-
VARIOUS	MIPR	MULTI : MULTI	243.180	36.689	Sep 2020	92.023	Sep 2021	103.575	Sep 2022	-		103.575	Continuing	Continuing	-
		Subtotal	243.180	70.227		92.023		103.575		-		103.575	Continuing	Continuing	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	243.180	70.227		92.023		103.575		-		103.575	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604331D8Z / *Rapid Prototyping Program*	**Project (Number/Name)** 638 / *Rapid Prototyping Program*

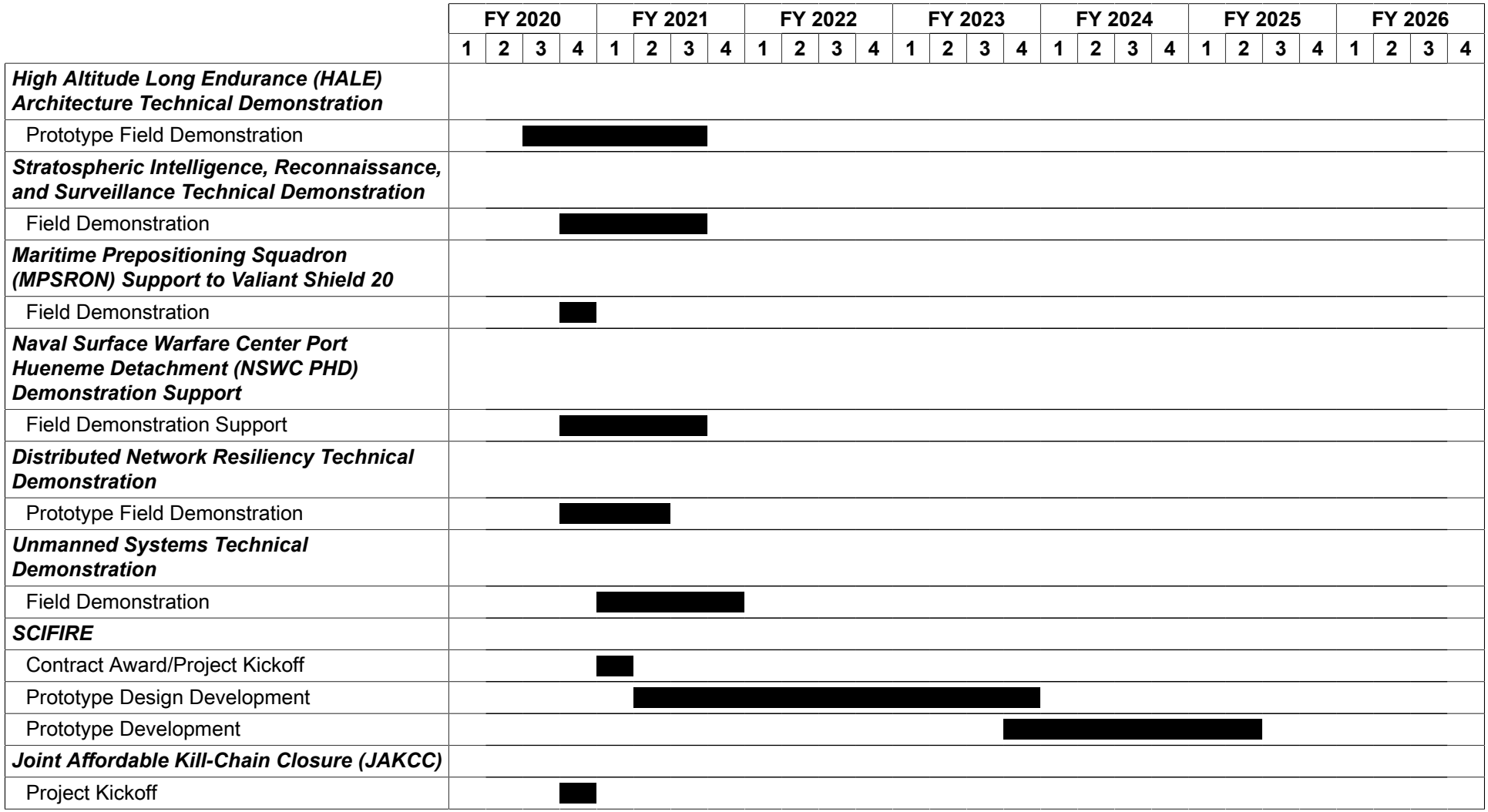


Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604331D8Z / *Rapid Prototyping Program*	**Project (Number/Name)** 638 / *Rapid Prototyping Program*

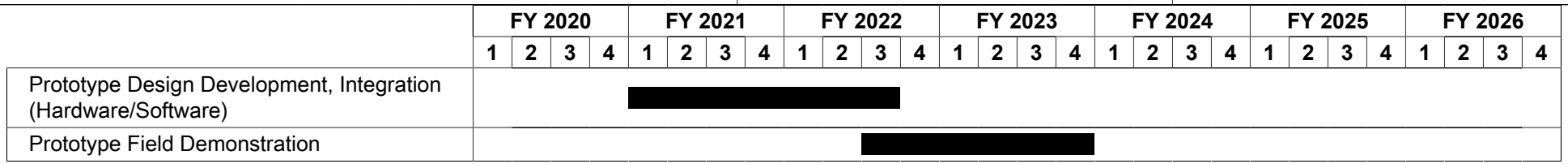


Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604331D8Z / *Rapid Prototyping Program*	**Project (Number/Name)** 638 / *Rapid Prototyping Program*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
High Altitude Long Endurance (HALE) Architecture Technical Demonstration				
Prototype Field Demonstration	3	2020	3	2021
Stratospheric Intelligence, Reconnaissance, and Surveillance Technical Demonstration				
Field Demonstration	4	2020	3	2021
Maritime Prepositioning Squadron (MPSRON) Support to Valiant Shield 20				
Field Demonstration	4	2020	4	2020
Naval Surface Warfare Center Port Hueneme Detachment (NSWC PHD) Demonstration Support				
Field Demonstration Support	4	2020	3	2021
Distributed Network Resiliency Technical Demonstration				
Prototype Field Demonstration	4	2020	2	2021
Unmanned Systems Technical Demonstration				
Field Demonstration	1	2021	4	2021
SCIFIRE				
Contract Award/Project Kickoff	1	2021	1	2021
Prototype Design Development	2	2021	4	2023
Prototype Development	4	2023	2	2025
Joint Affordable Kill-Chain Closure (JAKCC)				
Project Kickoff	4	2020	4	2020
Prototype Design Development, Integration (Hardware/Software)	1	2021	3	2022
Prototype Field Demonstration	3	2022	4	2023

THIS PAGE INTENTIONALLY LEFT BLANK

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604341D8Z / *DIU Prototyping*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	0.000	22.000	31.255	11.213	-	11.213	-	-	-	-	-	-
843: *DIU Prototyping*	0.000	22.000	31.255	6.213	-	6.213	-	-	-	-	-	-
844: *National Security Innovation Capital*	-	0.000	0.000	5.000	-	5.000	-	-	-	-	-	-

Note

Defense Innovation Unit Experimental (DIUx) was established in April 2015 and transitioned to 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, Secretary Mattis re-designated DIUx as the Defense Innovation Unit (DIU), removing the “x” (experimental) from the organization name to signify the permanence of the program. Effective FY 2020, DIU funding transferred from WHS to OSD, consistent with the organizational realignment under OUSD(R&E) following the disestablishment of the Office of the USD(Acquisition, Technology, & Logistics). This realignment also integrated the Unit into the broader Department of Defense research and engineering community, which provided opportunities to coordinate and de-conflict similar activities with the military departments, Defense Agencies, Department of Defense laboratories, the Defense Advanced Research Project Agency, the Small Business Innovation Research Program, and other entities in alignment with section 244 of the NDAA for FY19.

A. Mission Description and Budget Item Justification

The DIU mission is to strengthen U.S. national security by accelerating the adoption of commercial technology throughout the military and growing the national security innovation base. DIU partners with organizations across the Department of Defense (DoD), from the Services and components to combatant commands and defense agencies, to rapidly prototype and field advanced commercial solutions that address national security challenges. With offices in Silicon Valley, Boston, Austin, and in the Pentagon, DIU connects its DoD partners with leading technology companies across the country.

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), must reform our acquisition policies and approach to sustaining military-technical superiority. Notably, the critical technologies that forge military-technical superiority are increasingly dual use and rapidly developed by the commercial sector. While adversaries are challenging the U.S. across several dimensions, most importantly, our near peer competitors 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 the United States’ ability to project power, maintain international norms and rule of law, to provide credible deterrence, and prevail in conflict.

DIU increases the Department's access to leading-edge commercial technologies and talent, 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 national security innovation base to include more "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.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604341D8Z / *DIU Prototyping*

Through a competitive prototype process, DIU identifies and provides access to technology companies and products on behalf of DoD organizations. Additionally, DIU executes projects to leverage commercial sector technology analogous to military applications thereby increasing dual-use technology agility for the DoD. DIU Prototyping funds facilitate the award of projects that can augment commercial technologies, existing government-owned capabilities, or concepts for defense application.

DIU focus on six technology areas where commercial industry is the lead:
• Advanced Energy and Materials - Leveraging proven advancement in energy and materials technology to enhance capabilities and strengthen resilience across installation and distributed operations.
• Artificial Intelligence (AI)/ Machine Learning (ML) – Applying AI/ML learning to accelerate critical decision making and operation impact.
• Autonomy – Adopting and countering autonomous systems with a focus on human-machine interaction and scalable teaming.
• Cyber – Making enterprise combat information open, accessible, and secure for defense personnel across the globe.
• Human Systems – Optimizing the human system and its enabling platforms through enhanced equipment, innovative training, and novel health applications.
• Space – Developing on-demand access to space, persistent satellite capabilities, and broadband space data transfer.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	17.000	13.255	12.867	-	12.867
Current President's Budget	22.000	31.255	11.213	-	11.213
Total Adjustments	5.000	18.000	-1.654	-	-1.654
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	18.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• COVID-19	5.000	-	-	-	-
• Program Adjustment	-	-	-1.654	-	-1.654

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2020	FY 2021
Project: 843: *DIU Prototyping*		
Congressional Add: *Pilot Program on Talent Management: Gig Eagle*	-	3.000
Congressional Add: *National Security Innovation Capital*	-	15.000
Congressional Add Subtotals for Project: 843	-	18.000

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604341D8Z / *DIU Prototyping*

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2020	FY 2021
Congressional Add Totals for all Projects	-	18.000

Change Summary Explanation

The FY 2021 increase supports Gig Eagle, a real-time talent market platform, and NSIC to support dual-use hardware startups. Project 844 NSIC was initially requested in the FY 2020 President's Budget submission; however, FY 2021 is the first year the project receives funding.

The FY 2022 funding request was reduced by $2.200 million to account for the availability of prior year execution balances.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604341D8Z / *DIU Prototyping*	Project (Number/Name) 843 / *DIU Prototyping*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
843: *DIU Prototyping*	0.000	22.000	31.255	6.213	-	6.213	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Defense Innovation Unit Experimental (DIUx) was established in April 2015 and transitioned to 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, Secretary Mattis re-designated DIUx as the Defense Innovation Unit (DIU), removing the “x” (experimental) from the organization name to signify the permanence of the program. Effective FY 2020, DIU funding transferred from WHS to OSD, consistent with the organizational realignment under OUSD(R&E) following the disestablishment of the Office of the USD(Acquisition, Technology, & Logistics). This realignment also integrated the Unit into the broader Department of Defense (DoD) research and engineering community, which provided opportunities to coordinate and de-conflict similar activities with the military departments, Defense Agencies, Department of Defense laboratories, the Defense Advanced Research Project Agency, the Small Business Innovation Research Program, and other entities in alignment with section 244 of the NDAA for FY19.

A. Mission Description and Budget Item Justification

The DIU mission is to strengthen U.S. national security by accelerating the adoption of commercial technology throughout the military and growing the national security innovation base. DIU partners with organizations across the Department of Defense (DoD), from the Services and components to combatant commands and defense agencies, to rapidly prototype and field advanced commercial solutions that address national security challenges. With offices in Silicon Valley, Boston, Austin, and in the Pentagon, DIU connects its DoD partners with leading technology companies across the country.

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, must reform our acquisition policies and approach to sustaining military-technical superiority. Notably, the critical technologies that forge military-technical superiority are increasingly dual use and rapidly developed by the commercial sector. While adversaries are challenging the U.S. across several dimensions, most importantly, our near peer competitors 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 the United States’ ability to project power, maintain international norms and rule of law, to provide credible deterrence, and prevail in conflict.

DIU increases the Department's access to leading-edge commercial technologies and talent, 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 national security innovation base to include more "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.

Through a competitive prototype process, DIU identifies and provides access to technology companies and products on behalf of DoD organizations. Additionally, DIU executes projects to leverage commercial sector technology analogous to military applications thereby increasing dual-use technology agility for the DoD.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604341D8Z / *DIU Prototyping*	**Project (Number/Name)** 843 / *DIU Prototyping*

DIU Prototyping funds facilitate the award of projects that can augment commercial technologies, existing government-owned capabilities, or concepts for defense application.

DIU focus on six technology areas where commercial industry is the lead:
• Advanced Energy and Materials - Leveraging proven advancement in energy and materials technology to enhance capabilities and strengthen resilience across installation and distributed operations.
• Artificial Intelligence (AI)/ Machine Learning (ML) – Applying AI/ML learning to accelerate critical decision making and operation impact.
• Autonomy – Adopting and countering autonomous systems with a focus on human-machine interaction and scalable teaming.
• Cyber – Making enterprise combat information open, accessible, and secure for defense personnel across the globe.
• Human Systems – Optimizing the human system and its enabling platforms through enhanced equipment, innovative training, and novel health applications.
• Space – Developing on-demand access to space, persistent satellite capabilities, and broadband space data transfer.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Defense Innovation Unit (DIU) Prototyping	22.000	13.255	6.213
Description: DIU will execute projects to leverage commercial sector technology analogous to military applications, thereby increasing dual-use technology adoption throughout 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 2021 Plans:*** 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. ***FY 2022 Plans:*** In FY 2022, 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. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The FY 2022 funding request was reduced by $2.200 million to account for the availability of prior year execution balances and accounts for realignment to NSIC and adjustment for inflation rate assumptions.			
Accomplishments/Planned Programs Subtotals	22.000	13.255	6.213

	FY 2020	FY 2021
Congressional Add: Pilot Program on Talent Management: Gig Eagle	-	3.000
FY 2021 Plans: The intent of the Gig Eagle program is to develop a department-wide talent optimization marketplace for military personnel in the Reserve and Guard Components. The initial customer will be the U.S. Air Force, but each of the military departments are currently implementing various talent management		

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604341D8Z / *DIU Prototyping*	**Project (Number/Name)** 843 / *DIU Prototyping*

	FY 2020	FY 2021
reforms designed to allow military units to identify and access Servicemembers with pertinent and necessary experiences that might otherwise go unnoticed using traditional military assignment processes. Talent optimization efforts like Gig Eagle, which leverage commercial tools, promise to help the Department leverage the civilian and private sector skill sets of Reservists/Service members that are difficult for military units to develop or access within the regular force. The first iteration will focus on unlocking talent of the Reserve Components. The second iteration will expand the Gig Eagle talent pool to select active-duty members, civilians, inactive ready reserves members and other Department of Defense (DoD) personnel. The third iteration will further expand the talent pool beyond existing DoD employees, opening up access to the world's best non-DoD talent.		
Congressional Add: National Security Innovation Capital ***FY 2021 Plans:*** The concept of NSIC was authorized in the 2019 NDAA and has now been funded for the first time. The intent of NSIC is to address the challenges of inadequate, or alternatively adversarial, private investment in dual-use hardware technology startups. A team was created and NSIC stood up the first of week of March 2021. NSIC expects to execute the program by using Other Transaction Authority prototype development contracts with six to eight startups across various stages of development and types of technology. In addition, per Congressional requirement, NSIC will establish advisory relationships with the Defense Industrial Board and Defense Science Board. *Resources will be executed in project 844 NSIC*	-	15.000
Congressional Adds Subtotals	-	18.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

DIU primarily utilized Title 10 U.S. Code § 2371b authority to prototype projects to enhance military effectiveness through the Commercial Solutions Opening (CSO) process.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604341D8Z / *DIU Prototyping*	Project (Number/Name) 843 / *DIU Prototyping*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
DIU Prototyping	MIPR	Various : Various	-	0.159	Jan 2020	13.458	Jan 2021	6.213		-		6.213	Continuing	Continuing	-
Autonomy	C/FFP	Various : Various	-	3.328		0.322		-		-		-	Continuing	Continuing	-
Cyber	C/FFP	Various : Various	-	3.820		-		-		-		-	Continuing	Continuing	-
Human System	C/FFP	Various : Various	-	2.756		0.735		-		-		-	Continuing	Continuing	-
Space	C/FFP	Various : Various	-	6.937		1.740		-		-		-	Continuing	Continuing	-
COVID	C/FFP	Various : Various	-	5.000		-		-		-		-	Continuing	Continuing	-
AE&M	C/FFP	Various : Various	-	0.000		-		-		-		-	Continuing	Continuing	-
National Security Innovation Capital	MIPR	Various : Various	-	-		15.000	Jan 2022	-		-		-	Continuing	Continuing	-
		Subtotal	-	22.000		31.255		6.213		-		6.213	Continuing	Continuing	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	22.000		31.255		6.213		-		6.213	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604341D8Z / *DIU Prototyping*	**Project (Number/Name)** 843 / *DIU Prototyping*

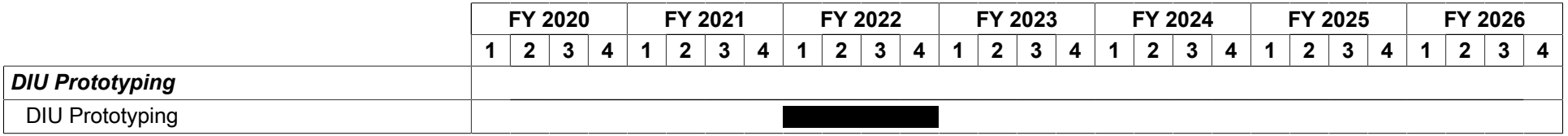


Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604341D8Z / *DIU Prototyping*	**Project (Number/Name)** 843 / *DIU Prototyping*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
DIU Prototyping				
DIU Prototyping	1	2022	4	2022

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604341D8Z / *DIU Prototyping*	Project (Number/Name) 844 / *National Security Innovation Capital*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
844: *National Security Innovation Capital*	-	0.000	0.000	5.000	-	5.000	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The mission of NSIC is to accelerate the development of dual-use hardware technologies critical to our national security and economic competitiveness. It is an initiative that enables dual-use hardware startups to advance key milestones in their product development by addressing the shortfall of private investment from trusted sources. NSIC's support will enable companies to develop their technologies and products more rapidly. The resulting reductions in technical risk, along with the signaling of DoD interest in such dual-use companies, will attract trusted private investment that might otherwise sit on the sidelines. The overall result will be more rapid and robust development of hardware in the U.S., and the expansion of defense industrial base.

Initial broad areas of focus are autonomy, communications, power, sensors and space technologies.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: National Security Innovation Capital (NSIC)	-	-	5.000
Description: The focus is funding the commercialization and scaling dual-use, hardware-based technologies that are critical to the military These technology areas are currently severely under-served by the private U. S. venture capital industry and often funded by strategic and persistent capital from China. NSIC's funding support will enable companies to further develop their technologies. The resulting reductions in technical risk, along with the signaling of DoD interest in such dual-use companies, will attract trusted private investment that might otherwise sit on the sidelines. The initial areas of interest for NSIC include rare earth elements technologies, batteries and portable power systems, small drones, quantum sensors and devices, and space components and subsystems. ***FY 2022 Plans:*** In FY 2022, NSIC plans to continue funding dual-use hardware startups developing products in autonomy, communications, power, sensors and space. Depending on the scope of the individual projects, NSIC will support requirements for several (three or four) companies. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The increase reflects a realignment of funding from DIU prototyping to NISC in support of opportunities for dual-use application.			
Accomplishments/Planned Programs Subtotals	-	-	5.000

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604341D8Z / *DIU Prototyping*	**Project (Number/Name)** 844 / *National Security Innovation Capital*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

NSIC primarily utilizes Title 10 U.S. Code § 2371b Other Transactions Authority to prototype projects to further develop dual-use, hardware-based technologies that are critical to the military through the Commercial Acceleration Opportunity (CAO) process.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604341D8Z / *DIU Prototyping*	Project (Number/Name) 844 / *National Security Innovation Capital*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
NSIC	C/TBD	Various : Various	-	-		0.000		5.000		-		5.000	Continuing	Continuing	-
		Subtotal	-	-		0.000		5.000		-		5.000	Continuing	Continuing	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		0.000		5.000		-		5.000	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604341D8Z / *DIU Prototyping*	**Project (Number/Name)** 844 / *National Security Innovation Capital*

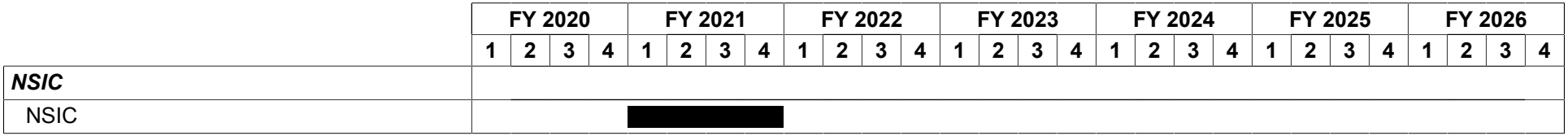


Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604341D8Z / *DIU Prototyping*	**Project (Number/Name)** 844 / *National Security Innovation Capital*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
NSIC				
NSIC	1	2021	4	2021

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604400D8Z *I Department of Defense (DoD) Unmanned Systems Common Development*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	81.394	6.565	7.085	2.778	-	2.778	-	-	-	-	-	-
440: *UAS Airspace Integration*	47.264	3.355	4.092	0.838	-	0.838	-	-	-	-	-	-
442: *Interoperability*	31.985	1.457	2.644	1.691	-	1.691	-	-	-	-	-	-
443: *Unmanned Systems Roadmap*	2.145	1.753	0.349	0.249	-	0.249	-	-	-	-	-	-

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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	7.021	2.787	2.832	-	2.832
Current President's Budget	6.565	7.085	2.778	-	2.778
Total Adjustments	-0.456	4.298	-0.054	-	-0.054
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-0.002			
• Congressional Rescissions	-	-			
• Congressional Adds	-	4.300			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-0.198	-			
• SBIR/STTR Transfer	-0.258	-			
• Program Adjustments	-	-	-0.054	-	-0.054

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604400D8Z / *Department of Defense (DoD) Unmanned Systems Common Development*	Project (Number/Name) 440 / *UAS Airspace Integration*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
440: *UAS Airspace Integration*	47.264	3.355	4.092	0.838	-	0.838	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

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 RQ-21 Blackjack 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 UAS Traffic Management (UTM) architectures, operating concepts, standards and technology are being developed to allow DoD, commercial, and privately 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 2020	FY 2021	FY 2022
Title: Unmanned Aircraft System Airspace Integration Initiatives	3.355	4.092	0.838
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 2020 Accomplishments:			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604400D8Z / *Department of Defense (DoD) Unmanned Systems Common Development*	**Project (Number/Name)** 440 / *UAS Airspace Integration*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Completed Final Operational Capability at Bealle AFB. GBSAA system at Grand Forks installation completed. FOC delayed due to reduction in Air Force funding in UAS Command and Control system software. Completed full testing of UTM Architecture and DoD unmanned Service Supplier System interfaces in coordination with the Department of Homeland Security and NASA. Completed DoD Concept of Operations (CONOPS) for UAS Integration into the UTM system. Conducted Integration of UTM into DoD Counter UAS Systems. ***FY 2021 Plans:*** Develop policy and architectures that support the operation of DoD and interagency Group 1-5 UAS systems in the National Airspace System (NAS) safely by developing a UTM system, Ground-Base Sense and Avoid, and Airbourne Sense and Avoid architectures. 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. ***FY 2022 Plans:*** Continue to develop policy and architectures that support the operation of DoD and interagency Group 1-5 UAS systems in the National Airspace System (NAS) safely by developing a UTM system, Ground-Base Sense and Avoid, and Airbourne Sense and Avoid architectures. Continue to 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. Continue to 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. Continue to develop quantitative safety assessment approaches that support unmanned systems operations to support emerging DoD needs and inform rulemaking with the interagency. Continue to 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. ***FY 2021 to FY 2022 Increase/Decrease Statement:***			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604400D8Z / *Department of Defense (DoD) Unmanned Systems Common Development*	**Project (Number/Name)** 440 / *UAS Airspace Integration*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
The decrease in funding from FY 2021 to FY 2022 is due to a Congressional add in FY 2021.			
Accomplishments/Planned Programs Subtotals	3.355	4.092	0.838

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604400D8Z / *Department of Defense (DoD) Unmanned Systems Common Development*	**Project (Number/Name)** 440 / *UAS Airspace Integration*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
GBSAA	MIPR	USAF A3 AFLCMC/ HBAG (VOLPE/ MITRE) : AFLCMC/ HBAG	34.492	0.160		3.341		0.041		-		0.041	Continuing	Continuing	-
DoD UTM	MIPR	NASA : Ames Research California	4.135	0.387		0.550		0.550		-		0.550	Continuing	Continuing	-
National Guard GBSAA	MIPR	Army PM UAS : Army Redstone, Alabama	5.863	0.000		-		-		-		-	Continuing	Continuing	-
DoD UxS adn C-UxS Architecture and Standards	MIPR	USAF/ARMY/ NAVY/NASA : Labs - California, NY, Alabama	-	2.371	Jul 2020	0.000		-		-		-	Continuing	Continuing	-
		Subtotal	44.490	2.918		3.891		0.591		-		0.591	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
USAF - A3 PBFA Support	Option/ LH	USAF A3 AFLCMC/ HBAG : AFLCMC/ HBAG	2.774	0.437		0.201		0.247		0.000		0.247	Continuing	Continuing	-
		Subtotal	2.774	0.437		0.201		0.247		0.000		0.247	Continuing	Continuing	N/A

Remarks

NA

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	47.264	3.355		4.092		0.838		0.000		0.838	Continuing	Continuing	N/A

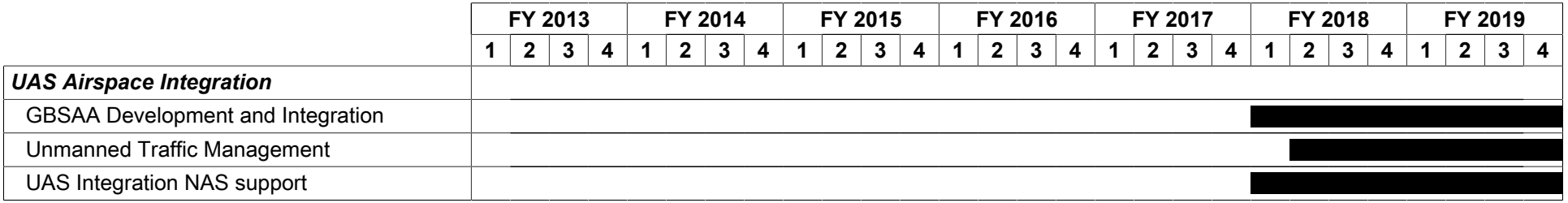
Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604400D8Z / *Department of Defense (DoD) Unmanned Systems Common Development*	Project (Number/Name) 440 / *UAS Airspace Integration*	

	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract

Remarks

NA

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604400D8Z / *Department of Defense (DoD) Unmanned Systems Common Development*	**Project (Number/Name)** 440 / *UAS Airspace Integration*



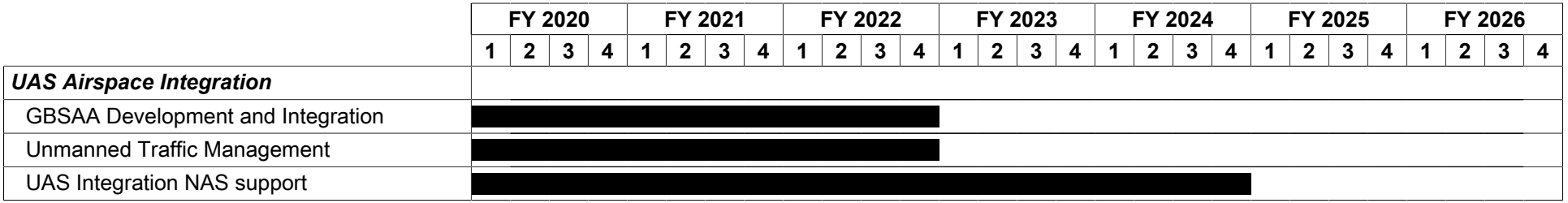


Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604400D8Z / *Department of Defense (DoD) Unmanned Systems Common Development*	**Project (Number/Name)** 440 / *UAS Airspace 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 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604400D8Z / *Department of Defense (DoD) Unmanned Systems Common Development*	Project (Number/Name) 442 / *Interoperability*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
442: *Interoperability*	31.985	1.457	2.644	1.691	-	1.691	-	-	-	-	-	-
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 2020	FY 2021	FY 2022
Title: Interoperability	1.457	2.644	1.691
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.			
FY 2021 Plans: Develop a UAS Architecture for Small Unmanned Systems. Validate Autonomous Safety Precepts for Unmanned Systems. Improve cybersecurity and communication links of UxS. Integrate Cyber Security Policies and Standards into UxS Architectures. Develop Acquisition strategies to support federal interagency small UAS architecture. Develop a Joint Communications Architecture for Unmanned systems (JCAUS) and demonstrate a JCAUS compliant prototypes to validate and further mature the architecture. Develop Safety standards and policy for Unmanned and Autonomous systems that will allow for the incorporation of AI. Continue support for Unmanned Systems Interoperability and Integration workshop/technical exchange meeting. Develop and Unmanned system autonomous test and Evaluation standards and architectures using modeling and simulation. Investigate a Cyber secure solution for integrating Artificial Intelligent systems into Unmanned Systems. Maintain the Joint Robotics and Autonomous Solutions Enterprise by maintaining DoD directed Interoperability standards across the service for all robotic and autonomous systems.			
FY 2022 Plans: Continue to develop a UAS Architecture for Small Unmanned Systems. Continue to validate Autonomous Safety Precepts for Unmanned Systems.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604400D8Z / *Department of Defense (DoD) Unmanned Systems Common Development*	**Project (Number/Name)** 442 / *Interoperability*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Continue to improve cybersecurity and communication links of UxS. Continue to integrate Cyber Security Policies and Standards into UxS Architectures. Continue to develop Safety standards and policy for Unmanned and Autonomous systems that will allow for the incorporation of AI. Continue support for Unmanned Systems Interoperability and Integration workshop/technical exchange meeting. Continue to develop and Unmanned system autonomous test and Evaluation standards and architectures using modeling and simulation. Continue to investigate a Cyber secure solution for integrating Artificial Intelligent systems into Unmanned Systems. Continue to maintain the Joint Robotics and Autonomous Systems Enterprise by maintaining DoD directed Interoperability standards across the service for all robotic and autonomous systems. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The decrease in funding from FY 2021 to FY 2022 is due to a Congressional add in FY 2021.			
Accomplishments/Planned Programs Subtotals	1.457	2.644	1.691

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

n/a

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604400D8Z / *Department of Defense (DoD) Unmanned Systems Common Development*	Project (Number/Name) 442 / *Interoperability*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 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	31.985	1.457	Apr 2020	2.644		1.691		-		1.691	Continuing	Continuing	-
		Subtotal	31.985	1.457		2.644		1.691		-		1.691	Continuing	Continuing	N/A

Remarks

NA

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	31.985	1.457		2.644		1.691		-		1.691	Continuing	Continuing	N/A

Remarks

NA

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604400D8Z / *Department of Defense (DoD) Unmanned Systems Common Development*	**Project (Number/Name)** 442 / *Interoperability*

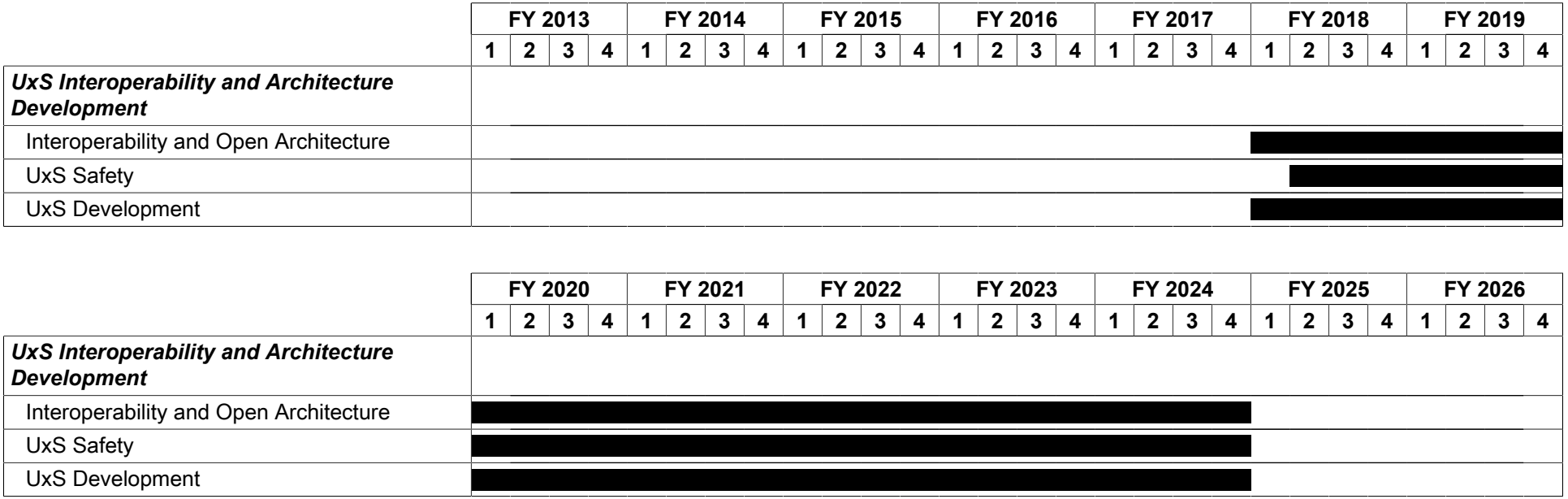


Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604400D8Z / *Department of Defense (DoD) Unmanned Systems Common Development*	**Project (Number/Name)** 442 / *Interoperability*

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 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604400D8Z / *Department of Defense (DoD) Unmanned Systems Common Development*	Project (Number/Name) 443 / *Unmanned Systems Roadmap*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
443: *Unmanned Systems Roadmap*	2.145	1.753	0.349	0.249	-	0.249	-	-	-	-	-	-
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 2020	FY 2021	FY 2022
Title: Unmanned Systems Roadmap	1.753	0.349	0.249

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 2020 Accomplishments:
-Established the Joint Robotics and Autonomous Systems Enterprise 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 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.
Investigate changes to concept of operations with guidance provided by Department's vision for unmanned systems.

FY 2022 Plans:
Update the FY 2021 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.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604400D8Z / *Department of Defense (DoD) Unmanned Systems Common Development*	**Project (Number/Name)** 443 / *Unmanned Systems Roadmap*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Continue to integrate feedback, responses, and new technology into the FY 2021 Roadmap. Continue to investigate changes to concept of operations with guidance provided by Department's vision for unmanned systems. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** No significant change from FY 2021 to FY 2022.			
Accomplishments/Planned Programs Subtotals	1.753	0.349	0.249

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604400D8Z / *Department of Defense (DoD) Unmanned Systems Common Development*	Project (Number/Name) 443 / *Unmanned Systems Roadmap*	

Support ($ in Millions)

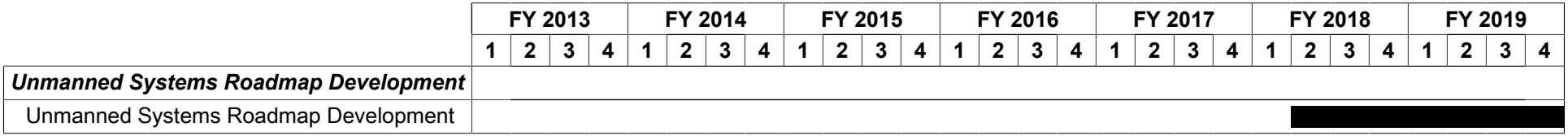
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Unmanned Systems Roadmap	C/LH	Army TARDEC Unmanned System Support services : Army TARDEC	2.145	1.753		0.349		0.249		-		0.249	Continuing	Continuing	-
		Subtotal	2.145	1.753		0.349		0.249		-		0.249	Continuing	Continuing	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	2.145	1.753		0.349		0.249		-		0.249	Continuing	Continuing	N/A

Remarks

NA

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604400D8Z / *Department of Defense (DoD) Unmanned Systems Common Development*	**Project (Number/Name)** 443 / *Unmanned Systems Roadmap*



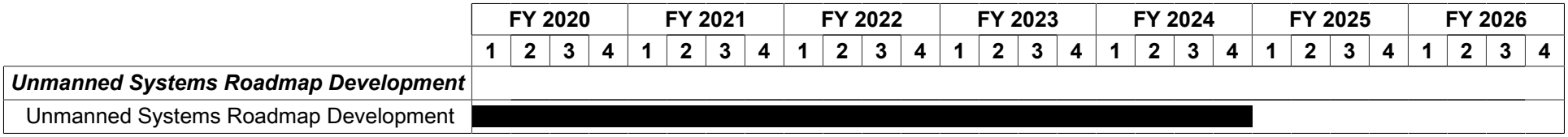


Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604400D8Z / *Department of Defense (DoD) Unmanned Systems Common Development*	**Project (Number/Name)** 443 / *Unmanned Systems 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

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604555D8Z / *Operational Energy Prototyping (OEP)*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	0.000	0.000	0.000	23.200	-	23.200	-	-	-	-	-	-
035: *Operational Energy Prototyping*	0.000	0.000	0.000	23.200	-	23.200	-	-	-	-	-	-

Note

New start in FY 2022.

A. Mission Description and Budget Item Justification

Operational Energy Prototyping (OEP) will identify and demonstrate the most promising, innovative, and cost-effective technologies and methods that address joint high-priority operational energy requirements. OEP funding efforts will identify and mitigate energy-related risks and increase warfighting capabilities and resilience. OEP will invest in prototype and demonstrations in three focus areas:

• Powering the Force: Support the deployment of mobile and distributed operations with resilient and agile energy logistics in contested environments. Reduce the risks, vulnerability, and climate impacts of DoD's dependence on fuel.

• Electrifying the Battlespace: Enable the electrification of weapons, platforms, unmanned systems, and soldiers to field new weapon, sensing, active defense, and other technologies. Meet the growing demands of power across the battlespace.

• Commanding Energy: Capture and understand energy profiles to transform the Joint Force from a reactive to a predictive energy management and control. Achieve real-time energy awareness and command and control at all levels. OEP serves as the program by which operational energy technology advances made under the Operational Energy Capability Innovation (OECI) can transition to military service acquisition programs. Transition plans for each prototype will be established to ensure that components have time to plan, program, and budget for technology transition to programs of record.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	0.000	0.000	-	0.000
Current President's Budget	0.000	0.000	23.200	-	23.200
Total Adjustments	0.000	0.000	23.200	-	23.200
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Climate Change Science & Technology Add	0.000	0.000	23.200	-	23.200

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604555D8Z *I Operational Energy Prototyping (OEP)*

Change Summary Explanation

OEP is a new program element in FY 2022. The Secretary of Defense, per Section 324(c)(1) of the 2021 National Defense Authorization Act, is required to "carry out a program for the demonstration of technologies related to operational energy prototyping, including demonstration of operational energy technology" through the Assistant Secretary of Defense for Energy, Installations, and Environment. Establishing OEP meets this Congressional requirement.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604555D8Z / *Operational Energy Prototyping (OEP)*	Project (Number/Name) 035 / *Operational Energy Prototyping*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
035: *Operational Energy Prototyping*	0.000	0.000	0.000	23.200	-	23.200	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

New start in FY 2022.

A. Mission Description and Budget Item Justification

Operational Energy Prototyping (OEP) will identify and demonstrate the most promising, innovative, and cost-effective technologies and methods that address joint high-priority operational energy requirements. OEP funding efforts will identify and mitigate energy-related risks and increase warfighting capabilities and resilience. OEP will invest in prototype and demonstrations in three focus areas:

• Powering the Force: Support the deployment of mobile and distributed operations with resilient and agile energy logistics in contested environments. Reduce the risks, vulnerability, and climate impacts of DoD's dependence on fuel.

• Electrifying the Battlespace: Enable the electrification of weapons, platforms, unmanned systems, and soldiers to field new weapon, sensing, active defense, and other technologies. Meet the growing demands of power across the battlespace.

• Commanding Energy: Capture and understand energy profiles to transform the Joint Force from a reactive to a predictive energy management and control. Achieve real-time energy awareness and command and control at all levels.

OEP serves as the program by which operational energy technology advances made under the Operational Energy Capability Innovation program (OECI) can transition to military service acquisition programs. Transition plans for each prototype will be established to ensure that components have time to plan, program, and budget for technology transition to programs of record.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Operational Energy Prototyping (OEP)	0.000	0.000	23.200
Description: Operational Energy Prototyping (OEP) will identify and demonstrate the most promising, innovative, and cost-effective technologies and methods that address joint high-priority operational energy requirements. OEP will invest in prototyping and demonstrations in four focus areas: (1) support prototype development of new operational energy technologies, (2) carry out formal demonstrations at installations or in conjunction with exercises conducted by the Joint Staff, a combatant command, or a military department, (3) collect cost and performance data to overcome barriers against employing an innovative technology because of concerns regarding technical or programmatic risk, and (4) provide the tools and analysis that quantifies the mission impact of these new technologies. Transition plans for each prototype will be established to ensure that components have time to plan, program, and budget for technology transition to programs of record.			
FY 2021 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604555D8Z / *Operational Energy Prototyping (OEP)*	**Project (Number/Name)** 035 / *Operational Energy Prototyping*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Stand up OEP as a new program in FY 2022 per congressional direction Section 324(c)(1) of the 2021 National Defense Authorization Act. ***FY 2022 Plans:*** These projects will focus on operational energy capability improvement outcomes ready for prototyping with clear transition pathways at completion. OEP is for surge projects that are eligible for one-year of funding at an estimated cost of not more than $4 million per project. There are over 35 OECIF projects culminating in FY 2021 that are eligible to compete for OEP funding in FY 2022. OEP eligible projects must have a transition partner in FY 2023 or FY 2024. OEP provides bridge funding upon successful advanced technology demonstrations, keeping momentum for projects that have warfighter transition support. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** OEP is a new program element in FY 2022. The Secretary of Defense, per Section 324(c)(1) of the 2021 National Defense Authorization Act, is required to “carry out a program for the demonstration of technologies related to operational energy prototyping, including demonstration of operational energy technology” through the Assistant Secretary of Defense for Energy, Installations, and Environment. Establishing OEP meets this Congressional requirement.			
Accomplishments/Planned Programs Subtotals	0.000	0.000	23.200

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 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604555D8Z / *Operational Energy Prototyping (OEP)*	**Project (Number/Name)** 035 / *Operational Energy Prototyping*

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Support Contract	C/IDDQ	TBD : TBD	0.000	0.000		0.000		1.200		-		1.200	Continuing	Continuing	N/A
		Subtotal	0.000	0.000		0.000		1.200		-		1.200	Continuing	Continuing	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Operational Energy Prototyping	TBD	Various : Various	0.000	0.000		0.000		22.000		-		22.000	Continuing	Continuing	N/A
		Subtotal	0.000	0.000		0.000		22.000		-		22.000	Continuing	Continuing	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.000		0.000		23.200		-		23.200	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604555D8Z / *Operational Energy Prototyping (OEP)*	**Project (Number/Name)** 035 / *Operational Energy Prototyping*

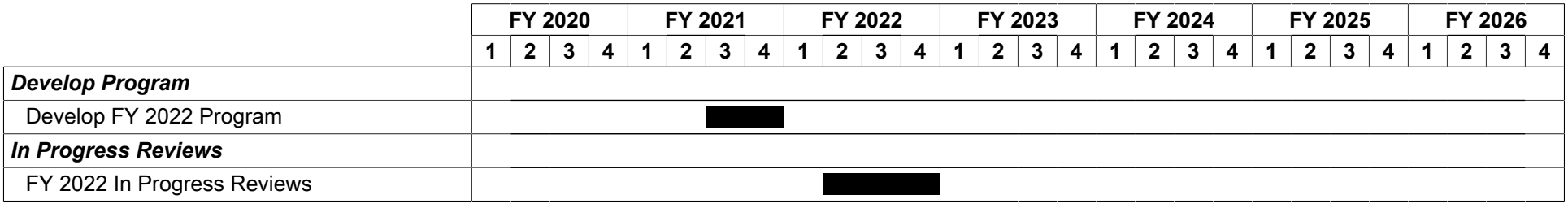


Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604555D8Z / *Operational Energy Proto typing (OEP)*	**Project (Number/Name)** 035 / *Operational Energy Prototyping*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Develop Program				
Develop FY 2022 Program	3	2021	4	2021
In Progress Reviews				
FY 2022 In Progress Reviews	2	2022	4	2022

THIS PAGE INTENTIONALLY LEFT BLANK

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0604682D8Z / *Wargaming & Support for Strategic Analysis (SSA)*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	11.157	3.613	3.469	3.519	-	3.519	-	-	-	-	-	-
104: *Wargaming & Support for Strategic Analysis*	11.157	3.613	3.469	3.519	-	3.519	-	-	-	-	-	-

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 Operation Plan development and DoD's approach to concept development, evaluation, and force development.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	3.751	3.469	3.624	-	3.624
Current President's Budget	3.613	3.469	3.519	-	3.519
Total Adjustments	-0.138	0.000	-0.105	-	-0.105
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Program Adjustment	-0.138	-	-0.105	-	-0.105

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense											Date: May 2021	
Appropriation/Budget Activity 0400 / 4					R-1 Program Element (Number/Name) PE 0604682D8Z / *Wargaming & Support for Strategic Analysis (SSA)*				Project (Number/Name) 104 / *Wargaming & Support for Strategic Analysis*			
COST ($ in Millions)	**Prior Years (+)**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
104: *Wargaming & Support for Strategic Analysis*	11.157	3.613	3.469	3.519	-	3.519	-	-	-	-	-	-
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

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 future 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 and strategic and programmatic options for post INF treaty weapons options.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022
Title: Wargaming & Support for Strategic Analysis	3.613	3.469	3.519
Articles:	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 2021 Plans: Studies, analyses, and assessments will be focused on: - Developing and refining warfighting objectives from senior leader priorities and Strategic Support Analysis activities. - Overseeing concept, analysis, and force design work			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604682D8Z / *Wargaming & Support for Strategic Analysis (SSA)*	**Project (Number/Name)** 104 / *Wargaming & Support for Strategic Analysis*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2020	FY 2021	FY 2022
- Providing guidance to DoD on best practices for Service Concepts ***FY 2022 Plans:*** Studies, analyses, and assessments will be focused on: - Developing and refining warfighting objectives from senior leader priorities and Strategic Support Analysis activities. - Overseeing concept, analysis, and force design work - Providing guidance to DoD on best practices for Service Concepts and long range fires decision ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 maintains a virtual steady-state level of effort to support senior DoD leadership requirements, with a minor internal alignment reflecting FY 2022 fiscal guidance, as well as programmatic adjustments.			
Accomplishments/Planned Programs Subtotals	3.613	3.469	3.519

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 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604682D8Z / *Wargaming & Support for Strategic Analysis (SSA)*	Project (Number/Name) 104 / *Wargaming & Support for Strategic Analysis*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Wargaming & Support for Strategic Analysis	C/Various	Various : DC Metro Area	11.157	3.613	Jan 2020	3.469	Jan 2021	3.519		-		3.519	Continuing	Continuing	N/A
		Subtotal	11.157	3.613		3.469		3.519		-		3.519	Continuing	Continuing	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	11.157	3.613		3.469		3.519		-		3.519	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 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604682D8Z / *Wargaming & Support for Strategic Analysis (SSA)*	**Project (Number/Name)** 104 / *Wargaming & Support for Strategic Analysis*

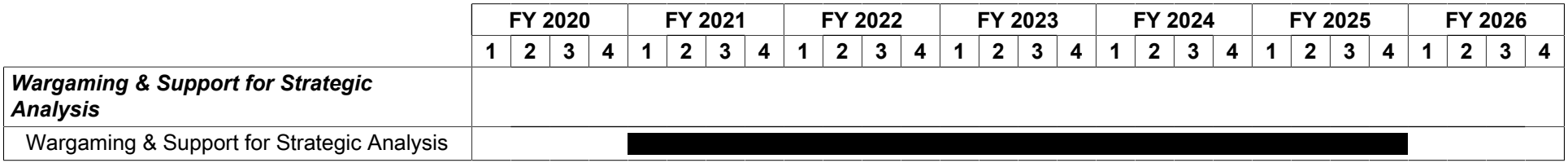


Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0604682D8Z / *Wargaming & Support for Strategic Analysis (SSA)*	**Project (Number/Name)** 104 / *Wargaming & Support for Strategic 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

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0303191D8Z / *Joint Electromagnetic Technology (JET) Program*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	17.081	3.190	0.997	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
192: *Joint Electromagnetic Technology (JET) Program*	17.081	3.190	0.997	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Starting in FY 2022, PE 0303191D8Z Joint Electromagnetic Technology (JET) Program transfers to PE 0305199D8Z Net Centricity.

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 on 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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	3.191	0.997	0.997	-	0.997
Current President's Budget	3.190	0.997	0.000	-	0.000
Total Adjustments	-0.001	0.000	-0.997	-	-0.997
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Program Adjustment	-0.001	-	-0.997	-	-0.997

Change Summary Explanation

Starting in FY 2022, PE 0303191D8Z Joint Electromagnetic Technology (JET) Program transfers to PE 0305199D8Z Net Centricity.

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: JET Program Initiatives	3.190	0.997	0.000

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0303191D8Z *I Joint Electromagnetic Technology (JET) Program*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
FY 2021 Plans: Program details are classified. ***FY 2022 Plans:*** Starting in FY 2022, PE 0303191D8Z Joint Electromagnetic Technology (JET) Program transfers to PE 0305199D8Z Net Centricity. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Starting in FY 2022, PE 0303191D8Z Joint Electromagnetic Technology (JET) Program transfers to PE 0305199D8Z Net Centricity.			
Accomplishments/Planned Programs Subtotals	3.190	0.997	0.000

D. Other Program Funding Summary ($ in Millions)

N/A

Remarks

E. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0303191D8Z / *Joint Electromagnetic Technology (JET) Program*	**Project (Number/Name)** 192 / *Joint Electromagnetic Technology (JET) Program*

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Technical Engineering Services	Option/ FFP	Various : Various	13.089	1.200	Jul 2020	-		-		-		-	-	-	-
		Subtotal	13.089	1.200		-		-		-		-	-	-	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management Support	C/Various	Various : Various	2.099	1.200	Jul 2020	-		-		-		-	-	-	-
Engineering Support FFRDC	Option/ Various	Various : Various	1.893	0.790	Jul 2020	0.997	Jul 2021	-		-		-	Continuing	Continuing	-
		Subtotal	3.992	1.990		0.997		-		-		-	Continuing	Continuing	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	17.081	3.190		0.997		-		-		-	Continuing	Continuing	N/A

Remarks

NA

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0303191D8Z / *Joint Electromagnetic Technology (JET) Program*	**Project (Number/Name)** 192 / *Joint Electromagnetic Technology (JET) Program*

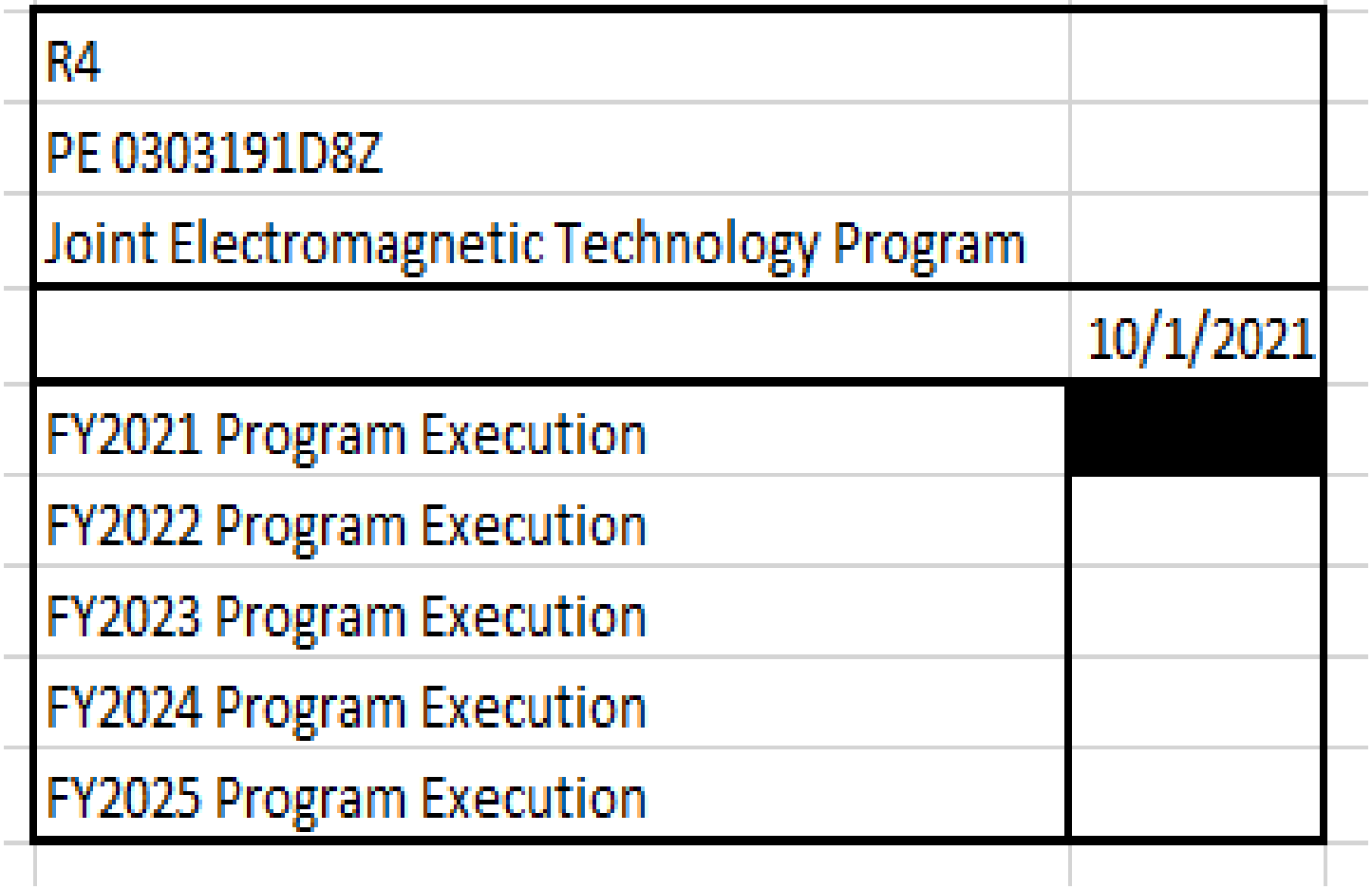


Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 4	**R-1 Program Element (Number/Name)** PE 0303191D8Z / *Joint Electromagnetic Technology (JET) Program*	**Project (Number/Name)** 192 / *Joint Electromagnetic Technology (JET) Program*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
****** SUBPROJECT TITLE ******				
FY21 Project Execution	3	2021	2	2022

THIS PAGE INTENTIONALLY LEFT BLANK

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 0604161D8Z / *Nuclear and Conventional Physical Security/National Technical Nuclear Forensics*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	81.685	7.810	7.169	5.682	-	5.682	-	-	-	-	-	-
163: *Nuclear and Conventional Physical Security*	65.635	7.810	7.069	5.682	-	5.682	-	-	-	-	-	-
042: *National Technical Nuclear Forensics / System Development & Demonstration (SDD)*	16.050	0.000	0.100	0.000	-	0.000	-	-	-	-	-	-

Note

Funding transferred from Countering Nuclear Threats (CNT) to National Technical Nuclear Forensics (NTNF), P041. In fiscal year 2018, Departments and Agencies began to shift research and development from NTNF to other mission areas. This resulted in degradation of the Department of Defense's (DoD) (and by default, the U.S. Government's (USG)) already limited ability to effectively and reliably execute the nuclear forensics mission. As the lead for providing the USG's post-detonation nuclear forensics capability, DoD is emphasizing the importance of this mission in deterring adversaries and ensuring success of the USG's post-detonation NTNF mission.

A. Mission Description and Budget Item Justification

Nuclear and Conventional Physical Security/National Technical Nuclear Forensics 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 National Technical Nuclear Forensics 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.

Funding associated with nuclear and conventional physical security materiel solutions for the Department are 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 Program 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 (PSEAG) is responsible for avoiding duplication of effort, ensuring systems integration, and promoting interoperability and sustainability.

Per Presidential Policy Directive 42, Annex C, the DoD provides the USG post-detonation NTNF capability. Per DoDD 2060.04, the Office of the Undersecretary of Defense for Acquisition & Sustainment (OUSD(A&S)) is the office responsible for developing and leading DoD's NTNF capabilities. Ensuring the USG can identify the source of nuclear material and hold those responsible for an attack accountable is critical to our national defense and security. Internal and independent assessments indicate new capabilities are needed to sustain an effective deterrent against nuclear attack and meet the challenges of future threats. This PE is the only DoD RDT&E program focused on System Development & Demonstration of post-detonation NTNF capabilities and without proper funding, DoD's ability to meet this critical deterrence need will be significantly degraded.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 0604161D8Z *I Nuclear and Conventional Physical Security/National Technical Nuclear Forensics*

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.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	11.276	7.173	6.164	-	6.164
Current President's Budget	7.810	7.169	5.682	-	5.682
Total Adjustments	-3.466	-0.004	-0.482	-	-0.482
• Congressional General Reductions	-	-0.004			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Program Adjustments	-3.466	-	-0.482	-	-0.482

Change Summary Explanation

The FY 2022 funding request was reduced by $0.302 million to account for the availability of prior year execution balances.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0604161D8Z / *Nuclear and Conventional Physical Security/National Technical Nuclear Forensics*	Project (Number/Name) 163 / *Nuclear and Conventional Physical Security*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
163: *Nuclear and Conventional Physical Security*	65.635	7.810	7.069	5.682	-	5.682	-	-	-	-	-	-
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 conventional physical security materiel solutions for the Department are 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 (PSEAG) is responsible for avoiding duplication of effort, ensuring systems integration, and promoting interoperability and sustainability.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Detection and Assessment	3.585	4.069	2.502
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. 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. ***FY 2021 Plans:***			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0604161D8Z / *Nuclear and Conventional Physical Security/National Technical Nuclear Forensics*	**Project (Number/Name)** 163 / *Nuclear and Conventional Physical Security*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
• Determine the ability of up to four commercially available handheld backscatter x-ray systems to detection improvised explosive devices, bulk explosives, and weapons. • Expand the test and evaluation of explosive detection equipment to detect trace and bulk explosives through new technology advancements to include vapor detection. • Conduct rapid, onsite evaluations of various commercially available passive/active MMW-based personnel screening systems. ***FY 2022 Plans:*** • Evaluate at least three commercial off-the-shelf systems, with an option of an additional three systems, that claim to detect trace energetic materials and are often employed for Entry Control Point screening. • Develop a differential Short Wave Infrared-based technology for the standoff detection of concealed explosives that is also capable of identifying the concealed explosive threat • Integrate a GOTS or COTS sonar capability in response to emergent waterside security requirements within the INDOPACOM / NORTHCOM areas of responsibility. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The decrease in FY 2022 is the result of planned program changes in OUSD(A&S). The FY 2022 funding request was reduced to account for the availability of prior year execution balances.			
Title: Access Controls	0.270	0.000	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. 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. ***FY 2021 Plans:*** • The Combatant Commands and the Services did not identify any material needs for this Budget Activity/Capability Area. ***FY 2022 Plans:***			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0604161D8Z / *Nuclear and Conventional Physical Security/National Technical Nuclear Forensics*	**Project (Number/Name)** 163 / *Nuclear and Conventional Physical Security*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
• The Combatant Commands and the Services did not identify any material needs for this Budget Activity/Capability Area. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** There was no change in funding from FY 2021 to FY 2022.			
Title: Installation and Transport Security ***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. 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 incident. U.S. 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. ***FY 2021 Plans:*** • The Combatant Commands and the Services did not identify any material needs for this Budget Activity/Capability Area. ***FY 2022 Plans:*** • Develop a Waterside Defensive System to counter threats in naval ports, above, on, and below the surface. The system will be fully integrated and monitored and controlled from the Installation Defense Operations Center. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The increase of in FY 2022 is the result of planned program changes in OUSD(A&S).	0.000	0.000	1.461
Title: Prevention ***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. 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.	0.000	0.000	1.719

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0604161D8Z / *Nuclear and Conventional Physical Security/National Technical Nuclear Forensics*	**Project (Number/Name)** 163 / *Nuclear and Conventional Physical Security*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
FY 2021 Plans: • The Combatant Commands and the Services did not identify any material needs for this Budget Activity/Capability Area. ***FY 2022 Plans:*** • Complete the review requirements, procure, perform suitability testing, implement design improvements, and demonstrate a fieldable stabilized crew-served heavy machine gun mount for naval applications. • Fully develop the prototype Sonar Navigated Autonomous Grabber Unmanned Underwater Vehicle (UUV) for autonomous swimmer/diver and UUV interdiction. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The increase in FY 2022 is the result of planned program changes in OUSD(A&S).			
Title: Storage and Safeguards ***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. Accomplishment: Combatant Commands and Service requirements did not dictate the need for System Development and Demonstration. ***FY 2021 Plans:*** • The Combatant Commands and the Services did not identify any material needs for this Budget Activity/Capability Area. ***FY 2022 Plans:*** • The Combatant Commands and the Services did not identify any material needs for this Budget Activity/Capability Area. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** There was no change in funding from FY 2021 to FY 2022.	0.000	0.000	0.000
Title: Decision Support Systems ***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, projects related to the creation and enhancement of common operating pictures, and the establishment of common architectures / interface standards.	2.955	3.000	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0604161D8Z / *Nuclear and Conventional Physical Security/National Technical Nuclear Forensics*	**Project (Number/Name)** 163 / *Nuclear and Conventional Physical Security*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
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 antiquated security systems that are based on high cost sensor technology with low-cost sensors used in fields like the automotive industry. ***FY 2021 Plans:*** • Complete the initial development of the PICARD project by testing and evaluating in an operationally relevant environment. ***FY 2022 Plans:*** • The Combatant Commands and the Services did not identify any material needs for this Budget Activity/Capability Area. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The decrease in FY 2022 is the result of the completion of the initial development of the PICARD project.			
Title: Analytical Support ***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. 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. ***FY 2021 Plans:*** • The Combatant Commands and the Services did not identify any material needs for this Budget Activity/Capability Area. ***FY 2022 Plans:*** • The Combatant Commands and the Services did not identify any material needs for this Budget Activity/Capability Area. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** There was no change in funding from FY 2021 to FY 2022.	1.000	0.000	0.000
Accomplishments/Planned Programs Subtotals	7.810	7.069	5.682

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0604161D8Z / *Nuclear and Conventional Physical Security/National Technical Nuclear Forensics*	**Project (Number/Name)** 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 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0604161D8Z / *Nuclear and Conventional Physical Security/National Technical Nuclear Forensics*	**Project (Number/Name)** 163 / *Nuclear and Conventional Physical Security*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 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	0.926	-		-		-		-		-	-	-	-
Trace Explosive Detection System Improvement	MIPR	EOD Tech Division : Indian Head, MD	1.352	-		-		-		-		-	-	-	-
Stabilized Crew-Served Heavy Machine Gun Mount	MIPR	NSWC Crane : Crane, IN	0.329	-		-		-		-		-	-	-	-
JIGSAW - TASS Integration	MIPR	Multiply Performers : Multiple Locations	1.383	-		-		-		-		-	-	-	-
Platform for Integrated C3 and Responsive Defense	MIPR	Air Force Technical Applications : Patrick AFB, Florida	-	3.000		3.000		-		-		-	-	-	-
Joint Expeditious Subsurface-threat Sonar Capability	MIPR	Multiple Performers : Multiple locations	-	-		-		0.849		-		0.849	Continuing	Continuing	-
Sonar Navigated Autonomous Grabber	MIPR	Multiple Performers : Multiple Locations	-	-		-		0.831		-		0.831	Continuing	Continuing	-
Small Arms Point Defense	MIPR	Multiple Performers : Multiple Locations	-	-		-		0.750		-		0.750	Continuing	Continuing	-
Waterside Defensive System	MIPR	Multiple Performers : Multiple Locations	-	-		-		1.526		-		1.526	Continuing	Continuing	-
		Subtotal	56.246	3.000		3.000		3.956		-		3.956	Continuing	Continuing	N/A

Remarks

NA

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0604161D8Z / *Nuclear and Conventional Physical Security/National Technical Nuclear Forensics*	**Project (Number/Name)** 163 / *Nuclear and Conventional Physical Security*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 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	0.896	-		-		-		-		-	-	-	-
Comparative Colorimetric	MIPR	EOD Tech Division : Indian Head, MD	2.087	-		-		-		-		-	-	-	-
Stand-Off Weapon Defeat IPT	MIPR	NSWC Dahlgren Division : Dahlgren Division	1.434	-		-		-		-		-	-	-	-
C-UAS in the Homeland	MIPR	Multiple Performers : Multiple Locations	1.372	-		-		-		-		-	-	-	-
PSEAG Test & Evaluation	MIPR	NIWC Atlantic : Charleston, SC	-	1.225		4.069		-		-		-	-	-	-
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		-		-		-		-	-	-	-
Trace Comparative	MIPR	EOD Tech Division : Indian Head, MD	-	-		-		0.895		-		0.895	Continuing	Continuing	-
Standoff Suicide Bomber Detection Development	MIPR	EOD Tech Division : Indian Head, MD	-	-		-		0.831		-		0.831	Continuing	Continuing	-
		Subtotal	9.389	4.810		4.069		1.726		-		1.726	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0604161D8Z / *Nuclear and Conventional Physical Security/National Technical Nuclear Forensics*	Project (Number/Name) 163 / *Nuclear and Conventional Physical Security*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Remarks NA															

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	65.635	7.810		7.069		5.682		-		5.682	Continuing	Continuing	N/A

Remarks
NA

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0604161D8Z / *Nuclear and Conventional Physical Security/National Technical Nuclear Forensics*	**Project (Number/Name)** 163 / *Nuclear and Conventional Physical Security*

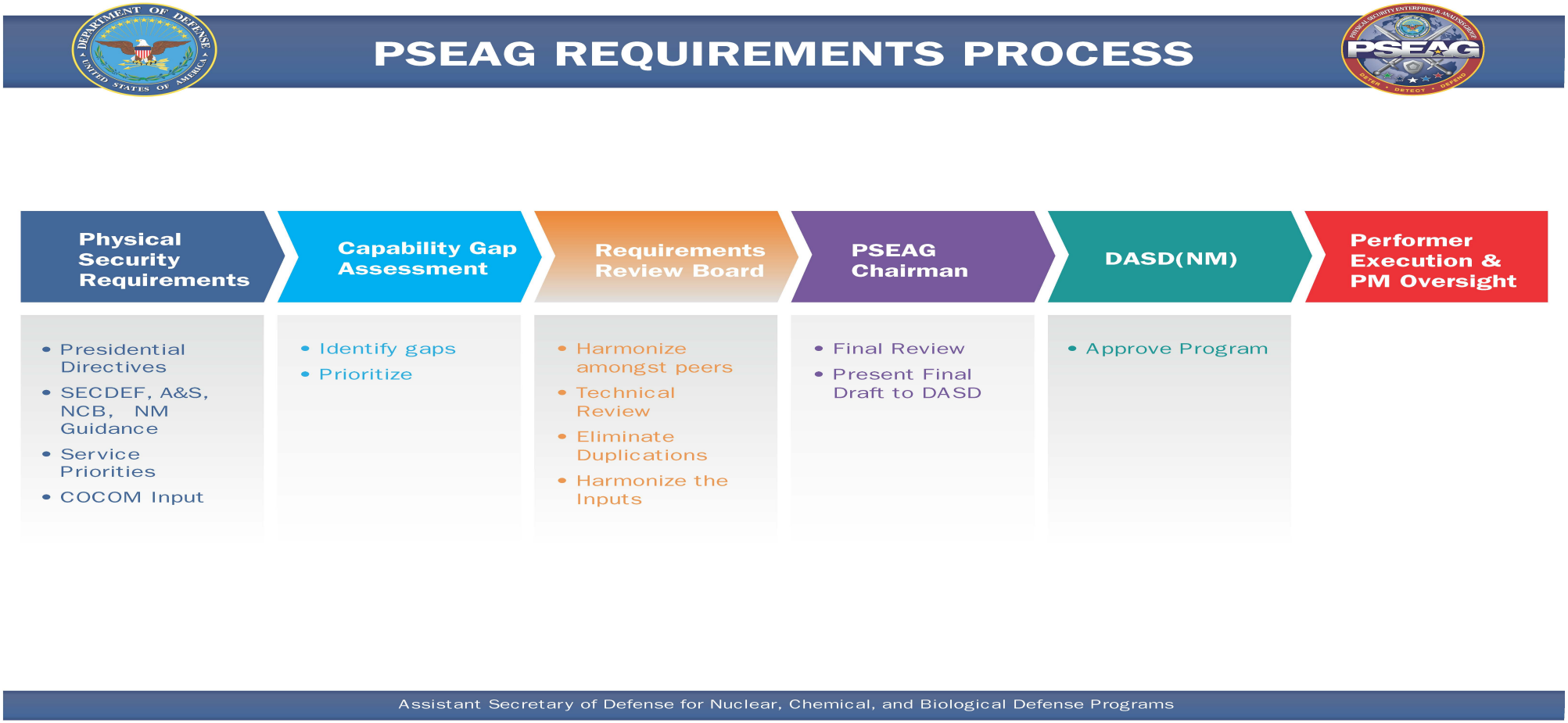


Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0604161D8Z / *Nuclear and Conventional Physical Security/National Technical Nuclear Forensics*	**Project (Number/Name)** 163 / *Nuclear and Conventional Physical Security*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Access Control				
Access Control	1	2013	4	2026
Analytical Support				
Analytical Support	1	2013	4	2026
Decision Support				
Decision Support	1	2013	4	2026
Detection & Assessment				
Detection & Assessment	1	2013	4	2026
Installation & Transport Security				
Installation & Transport Security	1	2013	4	2026
Prevention				
Prevention	1	2013	4	2026
Storage & Safeguards				
Storage & Safeguards	1	2013	4	2026

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0604161D8Z / *Nuclear and Conventional Physical Security/National Technical Nuclear Forensics*	Project (Number/Name) 042 / *National Technical Nuclear Forensics / System Development & Demonstration (SDD)*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
042: *National Technical Nuclear Forensics / System Development & Demonstration (SDD)*	16.050	0.000	0.100	0.000	-	0.000	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Funding transferred from CNT to NTNF, P041. 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 USG's) already limited ability to effectively and reliably execute the nuclear forensics mission. As the lead for providing the U.S. Government's post-detonation nuclear forensics capability, DoD is emphasizing the importance of this mission in deterring adversaries and ensuring success of the USG's post-detonation NTNF mission.

Prior Year, FY 2020, and FY 2021 funding is associated with the CNT program.

A. Mission Description and Budget Item Justification

Per Presidential Policy Directive 42, Annex C, the DoD provides the USG's post-detonation NTNF capability. Per DoDD 2060.04, the OUSD(A&S) is the DoD office responsible for DoD's NTNF capabilities. This program is the only DoD RDT&E program focused on System Development & Demonstration development of NTNF capabilities.

Ensuring the USG can identify the source of nuclear material and hold those involved or supporting an attack accountable 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, timely national response to a nuclear event and to prevent future attacks. An effective attribution capability ensures potential adversaries know that they will be held accountable if they use proxies or other non-traditional delivery of nuclear weapons against the U.S., U.S. interests, or allies. Both internal and independent studies indicate that continued improvement to USG NTNF capabilities is needed to sustain a credible deterrent against an attempted or actual nuclear attack.

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 in this area is limited by capacity and technical expertise. In FY 2018, Departments and Agencies began to shift research and development from NTNF to other mission areas, which resulted in degradation of the DoD's (and by default, the USG's) ability to execute the nuclear forensics mission and deter adversaries through the attrition of technical experts vital to the response. Sustained support of DoD's NTNF mission is crucial to not only preventing attrition of current capabilities and knowledge base, but in ensuring that this critical and unique deterrence capability is not lost, putting the security of the nation and the ability to deter specific kinds of nuclear attack at risk.

This PE can fund travel to support the requirements of this program.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0604161D8Z / *Nuclear and Conventional Physical Security/National Technical Nuclear Forensics*	**Project (Number/Name)** 042 / *National Technical Nuclear Forensics / System Development & Demonstration (SDD)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: NTNF Capability Development ***Description:*** The development of capability 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. ***FY 2021 Plans:*** There are no System Development & Demonstration requirements until FY 2025. ***FY 2022 Plans:*** There are no System Development & Demonstration requirements until FY 2025. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** N/A	0.000	0.000	0.000
Title: Countering Nuclear Threats ***Description:*** Funding transferred from CNT mission to NTNF, P041. This decision affects Program Elements 0603161D8Z and 0604161D8Z by eliminating the CNT program. NTNF, P041, was added to this Program Element to address System Development & Demonstration requirements. NOTE: Prior Year, FY 2020, and FY 2021 funding is associated with the CNT program. ***FY 2021 Plans:*** Complete the advanced development of the Radiological Detection System and transition to the Procurement ***FY 2022 Plans:*** Funding transferred to NTNF PE 0603161D8Z. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Decrease in funding is associated with the elimination of the CNT program.	0.000	0.100	0.000
Accomplishments/Planned Programs Subtotals	0.000	0.100	0.000

C. Other Program Funding Summary ($ in Millions)

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0604161D8Z / *Nuclear and Conventional Physical Security/National Technical Nuclear Forensics*	**Project (Number/Name)** 042 / *National Technical Nuclear Forensics / System Development & Demonstration (SDD)*

C. Other Program Funding Summary ($ in Millions)

Remarks

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0604161D8Z / *Nuclear and Conventional Physical Security/National Technical Nuclear Forensics*	Project (Number/Name) 042 / *National Technical Nuclear Forensics / System Development & Demonstration (SDD)*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
NTNF	TBD	TBD : TBD	-	-		-		-		-		-	Continuing	Continuing	-
CNT	Sub Allot	JPEO CBD : Aberdeen, MD	16.050	-		0.100		-		-		-	-	-	-
		Subtotal	16.050	-		0.100		-		-		-	Continuing	Continuing	N/A

Remarks

NTNF SDD requirements begin in FY 2025

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	16.050	-		0.100		-		-		-	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0604161D8Z / *Nuclear and Conventional Physical Security/National Technical Nuclear Forensics*	**Project (Number/Name)** 042 / *National Technical Nuclear Forensics / System Development & Demonstration (SDD)*

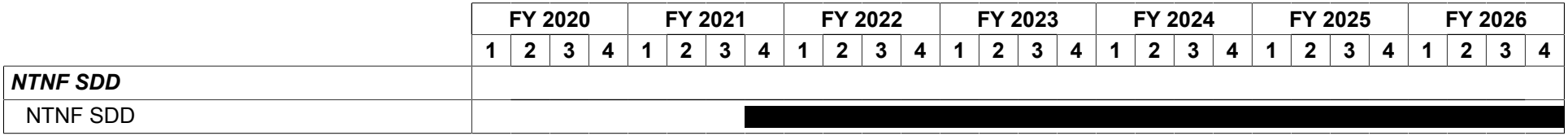


Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0604161D8Z / *Nuclear and Conventional Physical Security/National Technical Nuclear Forensics*	**Project (Number/Name)** 042 / *National Technical Nuclear Forensics / System Development & Demonstration (SDD)*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
NTNF SDD				
NTNF SDD	4	2021	4	2026

THIS PAGE INTENTIONALLY LEFT BLANK

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 0604165D8Z / *Prompt Global Strike Capability Development*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	2,120.906	152.782	89.863	0.000	-	0.000	-	-	-	-	-	-
166: *Alternate Re-Entry System/ Warhead Engineering*	2,120.906	53.549	0.000	0.000	-	0.000	-	-	-	-	-	-
065: *Joint Hypersonics*	0.000	99.233	89.863	0.000	-	0.000	-	-	-	-	-	-

Note

Funding from Project Code 065, Joint Hypersonics, will transfer to Program Element 0603183D8Z, Joint Hypersonic Technology Development & Transition, Project Code 066, Joint Hypersonic Transition Office (JHTO) in FY 2022 to align the JHTO mission and budget activity to congressional intent.

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 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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	151.000	0.000	0.000	-	0.000
Current President's Budget	152.782	89.863	0.000	-	0.000
Total Adjustments	1.782	89.863	0.000	-	0.000
• Congressional General Reductions	-	-0.137			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	90.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	2.966	-			
• SBIR/STTR Transfer	-1.158	-			
• Program Adjustments	-0.026	-	52.000	-	52.000

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense					Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 5: *System Development & Demonstration (SDD)*			R-1 Program Element (Number/Name) PE 0604165D8Z / *Prompt Global Strike Capability Development*		
• Transfer to Program Element 0603183D8Z	-	-	-52.000	-	-52.000

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2020	FY 2021
Project: 065: *Joint Hypersonics*		
Congressional Add: *University Consortium for Applied Hypersonics*	10.683	8.571
Congressional Add: *University Science and Technology Research Grants*	4.248	-
Congressional Add: *HyFly2 Initial Risk Mitigation Program*	34.621	9.229
Congressional Add: *Navigation, Guidance and Controls (NGC) Science and Technology Development*	13.371	18.946
Congressional Add: *Propulsion Science and Technology Development*	11.523	17.081
Congressional Add: *Systems Engineering, Design and Analysis (SEDA) Science and Technology Development*	5.150	7.346
Congressional Add: *Materials, Structures and Manufacturing (MSM) Science and Technology Development*	2.500	7.146
Congressional Add: *Ordnance Science and Technology Development*	4.050	5.846
Congressional Add: *Mission Planning Science and Technology Development*	3.750	3.346
Congressional Add: *Aerodynamics and Aerothermodynamics Science and Technology Development*	2.500	4.646
Congressional Add: *JHTO Manpower, Support and Administration*	2.152	3.021
Congressional Add: *JHTO Systems Engineering Field Activity at NSWC Crane*	4.685	4.685
Congressional Add Subtotals for Project: 065	99.233	89.863
Congressional Add Totals for all Projects	99.233	89.863

Change Summary Explanation

FY 2020 $0.026 million reduction is for other DoD priorities. FY 2021 $0.137 million reduction is Undistributed Reduction - Excess to Need.
FY 2022 $52.000 million will transfer to Program Element 0603183D8Z, Joint Hypersonic Technology Development & Transition, Project Code 066, Joint Hypersonic Transition Office (JHTO) to align the JHTO mission and budget activity to congressional intent.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0604165D8Z / *Prompt Global Strike Capability Development*	Project (Number/Name) 166 / *Alternate Re-Entry System/Warhead Engineering*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
166: *Alternate Re-Entry System/ Warhead Engineering*	2,120.906	53.549	0.000	0.000	-	0.000	-	-	-	-	-	-
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 2020	FY 2021	FY 2022
Title: Munitions Program ***Description:*** This is a classified munitions program, to be completed in FY 2020. Additional information available upon request.	53.549	-	-
Accomplishments/Planned Programs Subtotals	53.549	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

This is a classified munitions program, to be completed in FY 2020. Acquisition information available upon request.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0604165D8Z / *Prompt Global Strike Capability Development*	Project (Number/Name) 166 / *Alternate Re-Entry System/Warhead Engineering*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Munitions Program	MIPR	Various Performing Activities : Various	2,120.906	53.549		-		-		-		-	Continuing	Continuing	-
		Subtotal	2,120.906	53.549		-		-		-		-	Continuing	Continuing	N/A

Remarks

NA

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	2,120.906	53.549		0.000		-		-		-	Continuing	Continuing	N/A

Remarks

NA

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0604165D8Z / *Prompt Global Strike Capability Development*	**Project (Number/Name)** 166 / *Alternate Re-Entry System/Warhead Engineering*

	FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025				FY 2026			
	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
Munitions Program																												
Program milestones are classified, additional details available upon request.	[redacted]																											

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0604165D8Z / *Prompt Global Strike Capability Development*	**Project (Number/Name)** 166 / *Alternate Re-Entry System/Warhead Engineering*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Munitions Program				
Program milestones are classified, additional details available upon request.	1	2020	4	2021

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0604165D8Z / *Prompt Global Strike Capability Development*	Project (Number/Name) 065 / *Joint Hypersonics*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
065: *Joint Hypersonics*	0.000	99.233	89.863	0.000	-	0.000	-	-	-	-	-	-
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 (JHTO). This project will transfer to Program Element 0603183D8Z in FY 2022 to align the Joint Hypersonics Transition Office mission and budget activity to congressional intent.

A. Mission Description and Budget Item Justification

The Joint Hypersonics Transition Office (JHTO) within the Office of the Under Secretary of Defense for Research and Engineering (OUSD(R&E) was created to establish a university consortium for hypersonics research and support workforce development; expedite testing, evaluation, and acquisition of hypersonic technologies to meet the stated needs of the warfighter, including flight testing, ground-based-testing, and underwater launch testing; ensure that prototyping demonstration programs on hypersonic systems integrate advanced technologies to speed the maturation and deployment of future hypersonic systems; develop strategies and roadmaps for hypersonic technologies to enable the transition of such technologies to future operational capabilities for the warfighter; and develop and implement a strategy for enhancing the current and future hypersonics workforce.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021
Congressional Add: University Consortium for Applied Hypersonics	10.683	8.571
FY 2020 Accomplishments: The JHTO established a University Consortium for Applied Hypersonics in 1 Q FY 2021 as a well-balanced, geographically diverse, multi-disciplinary, collaborative ecosystem of university facilities, staff, researchers, and students working across institutions and with the Government to address applied hypersonics problems. The Consortium will help create a strong pipeline of research and workforce development initiatives to meet the future needs of the Department. The JHTO solicited research projects through the Consortium that address priorities and gaps identified by the JHTO Hypersonics Science and Technology (S&T) Roadmap, focusing on workforce development, applied research and advanced technology development related to the hypersonics mission. The Consortium will be available to meet the needs of the Services and all U.S. Government Agencies having a hypersonics mission.		
FY 2021 Plans: The JHTO plans to solicit research projects through the Consortium that address priorities and gaps identified by the JHTO Hypersonics Science and Technology (S&T) Roadmap, focusing on workforce development, applied research and advanced technology development related to the hypersonics mission. To facilitate development of the next generation hypersonics workforce, the JHTO intends to leverage the		

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0604165D8Z / *Prompt Global Strike Capability Development*	**Project (Number/Name)** 065 / *Joint Hypersonics*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021
Consortium to award scholarships to graduate students who are focusing on key hypersonic development areas. Additionally, the Consortium will host Consortium Industry Days, Project Industry Days, and participate in career/ internship fairs to cross-level information and enhance workforce development.		
Congressional Add: University Science and Technology Research Grants ***FY 2020 Accomplishments:*** The JHTO awarded eight University Grants through Naval Surface Warfare Center (NSWC) Crane, with the intent of providing rapid support to help sustain the university hypersonics community during the Covid-19 crisis while furthering hypersonics science and technology efforts across critical lines of inquiry. These grants, of approximately $0.500 million each, have been awarded to the following Universities: the University of Dayton Research Institute; Texas A&M University; the University of Texas at Austin; the University of Minnesota; the North Carolina State University; the University of Florida; the University of Michigan; and the University of Tennessee Space Institute. Solicitations for these Grants were based on priorities highlighted in the Hypersonics S&T Roadmap.	4.248	-
Congressional Add: HyFly2 Initial Risk Mitigation Program ***FY 2020 Accomplishments:*** This project continued research necessary to develop and field a hypersonic cruise missile. The project provided a series of weapon systems options and a program plan for a hypersonic cruise missile employable at stand-off range from naval vessels and aircraft. The HyFly2 Risk Mitigation Program builds on the successful Phase 1 Trade Study effort conducted from May 2019 to November 2019. During the Phase 1 effort, Boeing and Aerojet Rocketdyne (AR) conducted system trade studies that resulted in an updated HyFly2 weapon system configuration, a demonstration program plan, and the identification of major technical risks. ***FY 2021 Plans:*** Continue and complete the work initiated with FY 2020 funds, paving the way for a viable hypersonic cruise missile. Additional details regarding this project are sensitive and/or classified and will be provided upon request.	34.621	9.229
Congressional Add: Navigation, Guidance and Controls (NGC) Science and Technology Development ***FY 2020 Accomplishments:*** In alignment with the jointly-developed Hypersonics S&T Roadmap, the JHTO funded six NGC science and technology projects to improve the operational capabilities of both offensive and defensive hypersonic systems. These projects focus on navigation in contested environments, on-vehicle	13.371	18.946

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0604165D8Z / *Prompt Global Strike Capability Development*	**Project (Number/Name)** 065 / *Joint Hypersonics*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021
trajectory generation, communications risk reduction, guidance electronics, and conformal antenna development. Additional details regarding these projects are sensitive and/or classified and will be provided upon request. ***FY 2021 Plans:*** Continue activities initiated with FY 2020 funds. Additional details regarding FY 2021 NGC projects are sensitive and/or classified and will be provided upon request.		
Congressional Add: Propulsion Science and Technology Development ***FY 2020 Accomplishments:*** In alignment with the jointly-developed Hypersonics S&T Roadmap, the JHTO funded four propulsion science and technology projects designed to enhance propulsion capabilities for both offensive and defensive hypersonic systems. These efforts close critical gaps in the development of hypersonic cruise missiles and enhance range and/or payload capacity of boost-glide systems. Focus areas for these projects included solid rocket motor component technologies, expanding the operating envelope of Dual-Mode Ramjet/Scramjet propulsion systems, developing new actuator technologies for axial thrusters, and establishing a proof-of-principle for an improved endothermic fuel for hypersonic applications. Additional details regarding these projects are sensitive and/or classified and will be provided upon request. ***FY 2021 Plans:*** Continue activities initiated with FY 2020 funds. Additional details regarding FY 2021 propulsion projects are sensitive and/or classified and will be provided upon request.	11.523	17.081
Congressional Add: Systems Engineering, Design and Analysis (SEDA) Science and Technology Development ***FY 2020 Accomplishments:*** In alignment with the jointly-developed Hypersonics S&T Roadmap, the JHTO funded five SEDA science and technology projects designed to: (1) improve the modeling and prediction of hypersonic vehicle plumes, wakes, and signatures, and (2) provide performance baselines for offensive and defensive systems. Additional details are sensitive and/or classified and will be provided upon request. ***FY 2021 Plans:*** Continue activities initiated with FY 2020 funds. Additional details regarding FY 2021 SEDA projects are sensitive and/or classified and will be provided upon request.	5.150	7.346
Congressional Add: Materials, Structures and Manufacturing (MSM) Science and Technology Development ***FY 2020 Accomplishments:*** In alignment with the jointly-developed Hypersonics S&T Roadmap, the JHTO funded four MSM science and technology projects essential to develop new high-temperature materials for hypersonic applications and to design more efficient and effective manufacturing methods for hypersonic structural components. Specific projects seek to characterize alternative ceramic matrix composites for hypersonics, improve the ability to produce multiphase monolithic ceramic dielectric materials, test and	2.500	7.146

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0604165D8Z / *Prompt Global Strike Capability Development*	**Project (Number/Name)** 065 / *Joint Hypersonics*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021
characterize the performance of leading edge coatings, and improve manufacturing processes to build cruiser fins. Additional details regarding these projects are sensitive and/or classified and will be provided upon request. ***FY 2021 Plans:*** Continue activities initiated with FY 2020 funds. Additional details regarding FY 2021 MSM projects are sensitive and/or classified and will be provided upon request.		
Congressional Add: Ordnance Science and Technology Development ***FY 2020 Accomplishments:*** In alignment with the jointly-developed Hypersonics S&T Roadmap, the JHTO funded three ordnance science and technology projects to better understand hypersonic ordnance effects and improve those effects across a broad range of target sets. Projects develop and demonstrate a survivable fuze system designed to function under extreme hypersonic terminal conditions, model shock loads associated with a multi-mission warhead, and conduct high-fidelity modeling to analyze and optimize the effects of hypersonic munitions. Additional details regarding these projects are sensitive and/or classified and will be provided upon request. ***FY 2021 Plans:*** Continue activities initiated with FY 2020 funds. Additional details regarding FY 2021 Ordnance projects are sensitive and/or classified and will be provided upon request.	4.050	5.846
Congressional Add: Mission Planning Science and Technology Development ***FY 2020 Accomplishments:*** In alignment with the jointly-developed Hypersonics S&T Roadmap, the JHTO funded four mission planning science and technology projects to support rapid mission planning of hypersonic systems when employed in a variety of operational conditions. Projects focus on flight-trajectory survivability analysis, the development of prototype tools to facilitate rapid mission planning, and the assessment of weather impacts during different segments of hypersonic flight. Additional details regarding these projects are sensitive and/or classified and will be provided upon request. ***FY 2021 Plans:*** Continue activities initiated with FY 2020 funds. Additional details regarding FY 2021 Mission Planning projects are sensitive and/or classified and will be provided upon request.	3.750	3.346
Congressional Add: Aerodynamics and Aerothermodynamics Science and Technology Development ***FY 2020 Accomplishments:*** In alignment with the jointly-developed Hypersonics S&T Roadmap, the JHTO funded a aerodynamics and aerothermal science and technology project to enhance aero optics modeling and simulation testing. This project seeks to increase the fidelity of infrared aero optics modeling and simulation data	2.500	4.646

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0604165D8Z / *Prompt Global Strike Capability Development*	**Project (Number/Name)** 065 / *Joint Hypersonics*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021
while driving down man-hours through creation/validation of a more useful and collaborative collection format. Additional details are sensitive and/or classified and will be provided upon request. ***FY 2021 Plans:*** Continue activities initiated with FY 2020 funds. Additional details regarding FY 2021 Aerodynamics and Aerothermodynamics projects are sensitive and/or classified and will be provided upon request.		
Congressional Add: JHTO Manpower, Support and Administration ***FY 2020 Accomplishments:*** Supports all JHTO activities to include financial oversight, Hypersonic S&T Roadmap Development; competitive award of the University Consortium for Applied Hypersonics, competitive award of University Grants; administrative efforts associated with all S&T project funding, and general administrative support for conferences and reporting. Planned and obligated funding covers support contracts and support provided through the Johns Hopkins University Applied Physics Laboratory. ***FY 2021 Plans:*** Continue to support all JHTO activities, to include financial oversight, Hypersonic S&T Roadmap Development; oversight of the University Consortium for Applied Hypersonics, oversight of University Grants; administrative efforts associated with all S&T project funding, and general administrative support for conferences and reporting.	2.152	3.021
Congressional Add: JHTO Systems Engineering Field Activity at NSWC Crane ***FY 2020 Accomplishments:*** Supports systems engineering and integration for hypersonics development to generate efficiencies and facilitate technology transition. Support includes coordinating with systems engineering teams across the Services and programs; negotiating more modular Government Reference Architectures to support individual programs; define and execute system on-ramping plans, primarily; and guide accelerated development plans. Additionally, the activity represents JHTO as a technical execution area co-lead for workforce development. ***FY 2021 Plans:*** Continue to support cross-service systems engineering, technology transition, and workforce development.	4.685	4.685
Congressional Adds Subtotals	99.233	89.863

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0604165D8Z / *Prompt Global Strike Capability Development*	**Project (Number/Name)** 065 / *Joint Hypersonics*

D. Acquisition Strategy

NA

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0604165D8Z / *Prompt Global Strike Capability Development*	Project (Number/Name) 065 / *Joint Hypersonics*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
University Consortium for Applied Hypersonics	C/FFP	Texas A&M Engineering Experiment Station : College Station, TX	-	10.683	Oct 2020	8.571		-		-		-	Continuing	Continuing	-
University Science and Technology Research Grants	Grant	Multiple : Multiple	-	4.248	Sep 2020	-		-		-		-	Continuing	Continuing	-
HyFly2 Initial Risk Mitigation Program	MIPR	Boeing Defense and Aerospace : St. Charles, MO	-	34.621	Aug 2020	9.229		-		-		-	Continuing	Continuing	-
Navigation, Guidance and Controls Science and Technology Development	MIPR	Sandia Natl. Labs; Johns Hopkins University Applied Research Lab; MITRE; DARPA : Albuquerque, NM; Laurel, MD; McClean/Arlington, VA	-	13.371		18.946		-		-		-	Continuing	Continuing	-
Propulsion Science and Technology Development	MIPR	Air Force Research Labs; DARPA; MDA; Lockheed Martin; Aerojet Rocketdyne : Edwards, CA; Dayton, OH; Baytown, TX; Tucson, AZ	-	11.523		17.081		-		-		-	Continuing	Continuing	-
Systems Engineering, Design and Analysis Science and Technology Development	MIPR	U.S. Army Aviation & Missile Center : Huntsville, AL	-	5.150		7.346		-		-		-	Continuing	Continuing	-
Materials, Structures and Manufacturing Science and Technology Development	MIPR	NSWC Carderock; NASA; Air Force Research Labs : Bethesda, MD;	-	2.500		7.146		-		-		-	Continuing	Continuing	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0604165D8Z / *Prompt Global Strike Capability Development*	**Project (Number/Name)** 065 / *Joint Hypersonics*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
		Hampton, VA; Dayton, OH													
Ordnance Science and Technology Development	MIPR	Air Force Research Labs; NSWC Carderock; NSWC Indian Head : Eglin AFB, FL; Bethesda, MD, Indian Head, MD	-	4.050		5.846		-		-		-	Continuing	Continuing	-
Mission Planning Science and Technology Development	MIPR	Sandia National Labs; Army Aviation & Missile Center; Johns Hopkins University Applied Research Lab; Air Force Research Labs : Albuquerque, NM; Huntsville, AL; Laurel, MD	-	3.750		3.346		-		-		-	Continuing	Continuing	-
Aerodynamics and Aerothermodynamics Science and Technology Development	MIPR	MDA : Huntsville, AL	-	2.500		4.646		-		-		-	Continuing	Continuing	-
JHTO Systems Engineering Field Activity at NSWC Crane	MIPR	Naval Survace Warfare Center Crane Division : Crane, IN	-	4.685	Sep 2020	4.685		-		-		-	Continuing	Continuing	-
JHTO Manpower, Support, and Administration	Various	Frontier Technology, Inc., Johns Hopkins University Applied Physics Laboratory, Pending : Washington, DC.; Laurel MD, TBD	-	2.152		3.021		-		-		-	Continuing	Continuing	-
Tactical High-speed Offensive Ramjet for	MIPR	U.S. Navy Naval Air Warfare Center,	-	-		-		-		-		-	Continuing	Continuing	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0604165D8Z / *Prompt Global Strike Capability Development*	Project (Number/Name) 065 / *Joint Hypersonics*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Extended Range (THOR-ER)		Weapons Division China Lake; : China Lake, CA													
		Subtotal	-	99.233		89.863		-		-		-	Continuing	Continuing	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	99.233		89.863		-		-		-	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0604165D8Z / *Prompt Global Strike Capability Development*	**Project (Number/Name)** 065 / *Joint Hypersonics*

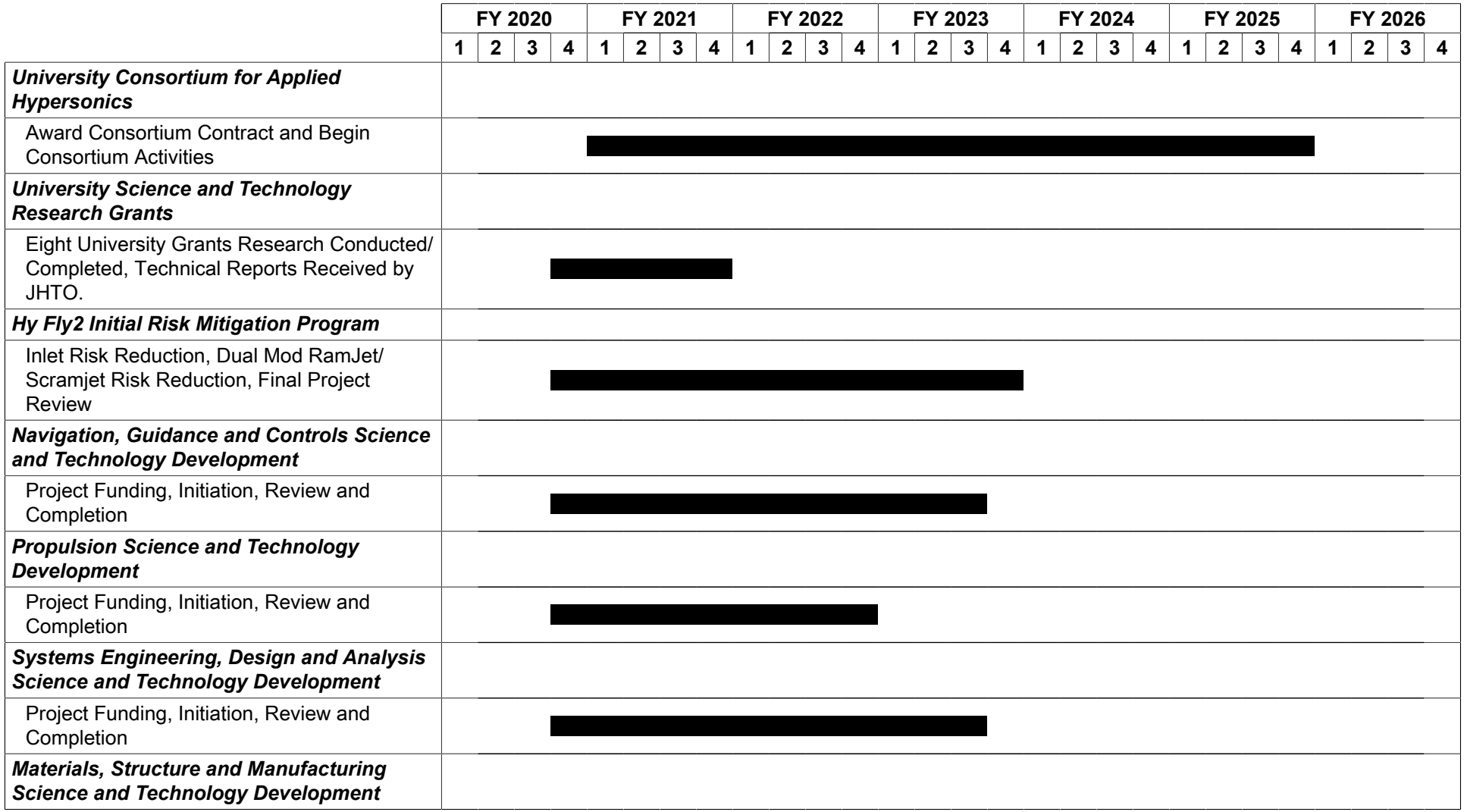


Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0604165D8Z / *Prompt Global Strike Capability Development*	**Project (Number/Name)** 065 / *Joint Hypersonics*

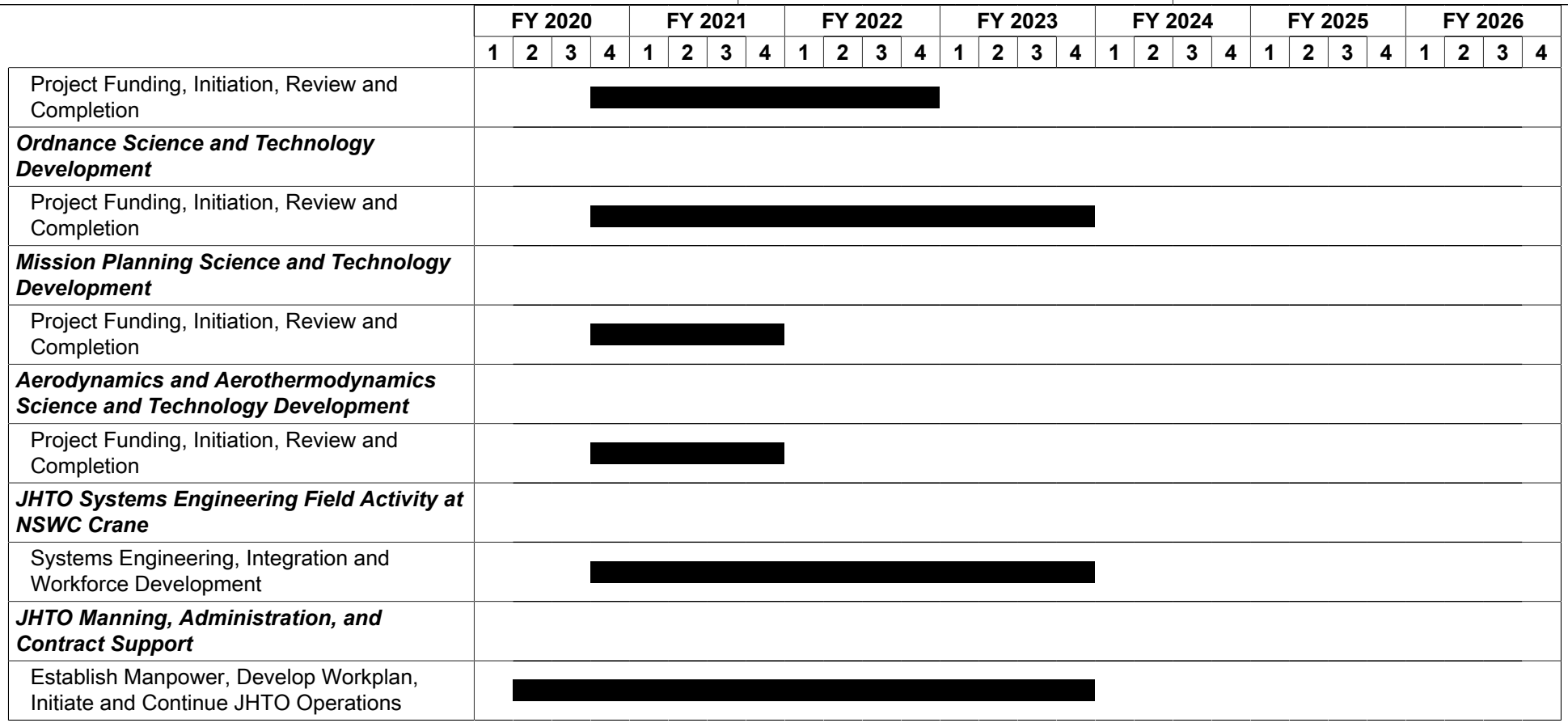


Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0604165D8Z / *Prompt Global Strike Capability Development*	**Project (Number/Name)** 065 / *Joint Hypersonics*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
University Consortium for Applied Hypersonics				
Award Consortium Contract and Begin Consortium Activities	1	2021	4	2025
University Science and Technology Research Grants				
Eight University Grants Research Conducted/Completed, Technical Reports Received by JHTO.	4	2020	4	2021
Hy Fly2 Initial Risk Mitigation Program				
Inlet Risk Reduction, Dual Mod RamJet/Scramjet Risk Reduction, Final Project Review	4	2020	4	2023
Navigation, Guidance and Controls Science and Technology Development				
Project Funding, Initiation, Review and Completion	4	2020	3	2023
Propulsion Science and Technology Development				
Project Funding, Initiation, Review and Completion	4	2020	4	2022
Systems Engineering, Design and Analysis Science and Technology Development				
Project Funding, Initiation, Review and Completion	4	2020	3	2023
Materials, Structure and Manufacturing Science and Technology Development				
Project Funding, Initiation, Review and Completion	4	2020	4	2022
Ordnance Science and Technology Development				
Project Funding, Initiation, Review and Completion	4	2020	4	2023
Mission Planning Science and Technology Development				
Project Funding, Initiation, Review and Completion	4	2020	4	2021
Aerodynamics and Aerothermodynamics Science and Technology Development				
Project Funding, Initiation, Review and Completion	4	2020	4	2021
JHTO Systems Engineering Field Activity at NSWC Crane				

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0604165D8Z / *Prompt Global Strike Capability Development*	**Project (Number/Name)** 065 / *Joint Hypersonics*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Systems Engineering, Integration and Workforce Development	4	2020	4	2023
JHTO Manning, Administration, and Contract Support				
Establish Manpower, Develop Workplan, Initiate and Continue JHTO Operations	2	2020	4	2023

THIS PAGE INTENTIONALLY LEFT BLANK

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 0604771D8Z / *Joint Tactical Information Distribution System (JTIDS)*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	171.548	52.059	51.284	9.345	0.000	9.345	-	-	-	-	-	-
771: *Link-16 Tactical Data Link (TDL) Transformation*	131.410	22.562	18.341	9.345	-	9.345	-	-	-	-	-	-
105: *Cyber Capability & Platform Resilience*	40.138	16.726	22.671	-	-	-	-	-	-	-	-	-
028: *Cybersecurity: Cybersecurity Maturity Model Certification (CMMC) and Pathfinders*	0.000	12.771	10.272	-	-	-	-	-	-	-	-	-

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)).

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	54.102	54.985	41.775	0.000	41.775
Current President's Budget	52.059	51.284	9.345	0.000	9.345
Total Adjustments	-2.043	-3.701	-32.430	0.000	-32.430
• Congressional General Reductions	-	-16.811			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	13.110			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Program Adjustments	-2.043	-	-32.430	-	-32.430

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 0604771D8Z / *Joint Tactical Information Distribution System (JTIDS)*

Change Summary Explanation

FY 2022 funding realigned to a 0606771D8Z for Chief Information Security Office.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0604771D8Z / *Joint Tactical Information Distribution System (JTIDS)*	Project (Number/Name) 771 / *Link-16 Tactical Data Link (TDL) Transformation*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
771: *Link-16 Tactical Data Link (TDL) Transformation*	131.410	22.562	18.341	9.345	-	9.345	-	-	-	-	-	-
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 2020	FY 2021	FY 2022
Title: Common Joint Tactical Information Initiatives	22.562	18.341	9.345
Description: FY 2020 Accomplishments: - Updated CDL technology development roadmap to reflect current trends in technology that can add enhanced capabilities to CDL systems and meet outcomes articulated in Joint Staff 2018 CDL Joint Vision and Roadmap. - Conducted 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. - Provided 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). - Contributed to development of congressionally mandated (NDAA FY2020, Section 254) DoD Fifth Generation (5G) Strategy and DoD 5G Implementation Plan. - Provided 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 C3 Leadership Board (C3LB) governance council. - Tracked and assessed 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.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0604771D8Z / *Joint Tactical Information Distribution System (JTIDS)*	**Project (Number/Name)** 771 / *Link-16 Tactical Data Link (TDL) Transformation*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
- Developed Joint C2 Acquisition Capability Portfolio Management strategy; developed program identification process, drafted proposed metrics plan and identified updates needed to the current C2 governance framework. - Implemented agile development practices into JC2 software driven acquisitions. Prototyped program health check and program future performance forecasting methodologies and tools to provide insights and recommendations to stakeholders before, during, and after senior steering committee meetings . Supported the NC3 Capability Portfolio Manager in drafting and coordinating strategic investment documents including the POM 23 Capability Planning Guidance; NC3 Capability Portfolio Management Working Group charter; NC3 Enterprise Acquisition Strategy; and an update to the NC3 Portfolio Definition List. - Reviewed DoD policy to ensure NC3 CPM synchronization. Documented concerns and assisted in staffing packages across the Office of Secretary of Defense, Combatant Command, and Services. Supported the review and staffing of four major reports to Congress. - Fielded initial analytic tool capability to track NC3 portfolio modernization objects including obligation and expenditures, reprogramming, and congressional marks. - Drafted comprehensive portfolio assessments on NC3 Very Low Frequency/Low Frequency receivers and Presidential Voice Conferencing Assessments. 5. Created NC3 Mission Threads, effects chains, and components and conditions to provide context for risk management. ***FY 2021 Plans:*** - Common Data Link (CDL) Capability Portfolio Management (CPM): Continue 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. Revise and reissue CDL enterprise modernization memo. Conduct annual CDL enterprise modernization analysis and review Service PPBE submissions to assess enterprise migration off To Be Sunset (CDL-TBD) waveforms by 2023. - 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 through four lines of effort 1) migrating long-term to a cross-component DCGS enterprise cloud solution; 2) utilizing the Defense Intelligence information Enterprise (DI2E) framework to establish a common DCGS data fabric; 3) advancing cyber security/accreditation reciprocity; and 4) developing a shared concept for how we will jointly operate to meet the objectives of the National Defense Strategy (NDS). - 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			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0604771D8Z / *Joint Tactical Information Distribution System (JTIDS)*	**Project (Number/Name)** 771 / *Link-16 Tactical Data Link (TDL) Transformation*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
(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. As part of C3LB governance structure, engage subordinate Senior Steering Groups on relevant matters: SATCOM Systems Engineering Group (SSEG), Tactical Communications Senior Steering Group (TCSSG), Electromagnetic Spectrum Senior Steering Group (EMS SSG), and Public Safety Communications Senior Steering Group (PSC SSG). - 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. JTNC priorities include: support for JADC2; chair of Communication Technology and Waveform Working Group (CTWWG) under the C3LB/TCSSG governance structure; Lead Service support with respect to key waveforms to comply with Deputy Secretary of Defense tasking; facilitate government and industry stakeholder interaction with Joint Communications Marketplace; Waveform Capability Characterization; HF Modernization support; Modular Radio Architecture efforts; and upgrading the DoD Information Repository operating environment. - 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 - 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 FY 2021 Plans. Provide funding for the Institute for Defense Analyses (IDA) to execute a requested study on the supply chain for radar production. Continue work with NDIA to engage industry on the development of spectrum sharing capability, regulations, and policies. Track and monitor spectrum conflict status between DoD, industry, and spectrum controlling bodies while promoting optimal use of spectrum for 5G through the NDIA working group as well as through the DoD 5G test beds. Facilitate the transition for 5G solutions, that are part of DoD 5G Strategy, to the Services, to be developed and tested through the DoD 5G test beds. Facilitate interaction with industry and countries to support mutual interests in 5G innovation and enhancing security measures to ensure availability, security, and reliability of the 5G supply chain. OUSD(A&S) seeks opportunities to inject 5G technologies into acquisition programs and takes advantage of smart warehousing and other 5G-enabled capabilities in DoD's sustainment systems.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0604771D8Z / *Joint Tactical Information Distribution System (JTIDS)*	**Project (Number/Name)** 771 / *Link-16 Tactical Data Link (TDL) Transformation*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
- Tactical Datalink: Complete assessment of TDL LPI/LPD waveforms and work with the Services to create a TDL Roadmap 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), F-35 Communications, Navigation & Identification (CNI) terminals, IR&D TDL progress, emerging 6th Gen aircraft and Weapons Data Link (WDL) concepts. Standardize TDL terminology and security classification of TDL waveforms. - Execute the Joint C2 Acquisition Capability Portfolio Management strategy in support of reprogramming decisions within year of execution and future years program budget development. Evolve the Joint C2 Acquisition Portfolio to include and provide acquisition integration and synchronization for materiel solutions sponsored through Joint All Domain Command and Control (JADC2) efforts. - Provide technical expertise for Joint All Domain Command and Control (JADC2) Operations Planning Teams (OPT), provide coordination and AO support for reviews of JADC2 Reference Architecture, Data Integration, Budget and Campaign Plan products as they are developed to support critical cross-functional team timelines and deliverables. - Support AISR DT ITF initiatives to provide material and non-materiel solutions that meet Combatant Commander AISR DT requirements by executing plans to increase dissemination of full-motion-video, download and disseminate sensor data from AISR platforms, and share AISR intelligence information with allies through implementation of cross-domain solutions. - Engage in C4/Cyber and Battlespace Awareness FCBs to ensure C4ISR Directorate equities and interests are adequately addressed and to help inform the management of systems within the C4ISR portfolio. - International: Continue support to the A&S International Cooperation on multiple efforts to support NDS Strengthen Alliances and Attract New Partners. Provide support to the US FR CIWG,the NGCC with the UK, and support for the multiple other minor efforts such as Yockey waivers, review of policy issues, and support for meetings. - Implement agile development practices into DoD and Intelligence Community software driven acquisitions. Develop and institute program health check and program future performance forecasting methodologies and tools to provide insights and recommendations to stakeholders before, during, and after senior steering committee meetings. - 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 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0604771D8Z / *Joint Tactical Information Distribution System (JTIDS)*	**Project (Number/Name)** 771 / *Link-16 Tactical Data Link (TDL) Transformation*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
- NC3: Support the NC3 Capability Portfolio Manager (CPM) with analysis presented to senior leadership bodies (NC3 Enterprise Review, Deputy's Management Action Group, SECDEF Weekly Priorities Review, etc.) and recommend investment and policy alternatives. Draft NC3 program protection planning policy, NC3 cybersecurity systems engineering standards, modernization assessments, sustainment assessments, and comprehensive NC3 portfolio assessments on High Frequency radio networks and Indications and Warning.			
FY 2022 Plans:			
- Common Data Link (CDL) Capability Portfolio Management (CPM): Continue 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.			
- 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 through four lines of effort 1) migrating long-term to a cross-component DCGS enterprise cloud solution; 2) utilizing the DI2E framework to establish a common DCGS data fabric; 3) advancing cyber security/accreditation reciprocity; and 4) developing a shared concept for how we will jointly operate to meet the objectives of the NDS.			
- 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. As part of C3LB governance structure, engage subordinate Senior Steering Groups on relevant matters: SATCOM Systems Engineering Group (SSEG), Tactical Communications Senior Steering Group (TCSSG), Electromagnetic Spectrum Senior Steering Group (EMS SSG), and Public Safety Communications Senior Steering Group (PSC SSG).			
- 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. JTNC will continue to execute core priorities including: support for JADC2; chair of Communication Technology and Waveform Working Group (CTWWG) under the C3LB/TCSSG governance structure; Lead Service support with respect to key waveforms to comply with Deputy Secretary of Defense tasking; facilitating government and			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0604771D8Z / *Joint Tactical Information Distribution System (JTIDS)*	**Project (Number/Name)** 771 / *Link-16 Tactical Data Link (TDL) Transformation*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
industry stakeholder interaction with Joint Communications Marketplace; Waveform Capability Characterization; HF Modernization support; Modular Radio Architecture efforts; and maintaining the DoD Information Repository operating environment. - 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 - Spectrum: Provide executive guidance, technical expertise, and acquisition support for the Spectrum Efficient National Air Surveillance Radar (SENSR) system. In FY22 SENSR milestones will include work specific to risk reduction efforts and the development and refinement of Implementation and Transition Plans. Integrate results from Institute for Defense Analyses (IDA) radar supply chain study into spectrum relocation efforts, updating plans as necessary. Continue work with the NDIA to engage industry on the development of spectrum sharing capability, regulations, and policies. Track and monitor spectrum conflict status between DoD, industry, and spectrum controlling bodies while promoting optimal use of spectrum for 5G through NDIA working group as well as through the DoD 5G test beds. Facilitate the transition for 5G solutions, that are part of DoD 5G Strategy, to the services, to be developed and tested through the DoD 5G test beds. Conducts interaction with industry and countries to support mutual interests in 5G innovation and enhancing security measures to ensure availability, security, and reliability of the 5G supply chain. OUSD(A&S) seeks opportunities to inject 5G technologies into acquisition programs and takes advantage of smart warehousing and other 5G-enabled capabilities in DoD's sustainment systems. - Tactical Datalink: Implement the TDL Roadmap using the JTWG as a coordination group to transition to TDL LPD/LPI waveforms as required by DEPSECDEF Memorandum "Enhancing DoD's Joint Tactical Networks and Datalink Modernization." Synchronize service acquisition strategies to gain synergistic efficiencies and maintain interoperability between the services, allies, and partner nations. Continue to 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. Continue support of international efforts including US France CIWG and other efforts to support NDS Strengthen Alliances and Attract New Partners. - Execute the Joint C2 Acquisition Capability Portfolio Management strategy in support of reprogramming decisions within year of execution and future years program budget development. Evolve the Joint C2 Acquisition Portfolio to include and provide acquisition integration and synchronization for materiel solutions sponsored through Joint All Domain Command and Control (JADC2) efforts. - Provide technical expertise for Joint All Domain Command and Control (JADC2) Operations Planning Teams (OPT), provide coordination and AO support for reviews of JADC2 Reference Architecture, Data Integration, Budget and Campaign Plan products as they are developed to support critical cross-functional team timelines and deliverables.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0604771D8Z / *Joint Tactical Information Distribution System (JTIDS)*	**Project (Number/Name)** 771 / *Link-16 Tactical Data Link (TDL) Transformation*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
- Support AISR DT ITF initiatives to provide material and non-materiel solutions that meet Combatant Commander AISR DT requirements by developing/improving the capabilities of AISR platforms to enable/expand the download and/or relay of sensor information through DoD gateways to U.S. warfighters and U.S. allies in each of the geographic Combatant Commanders' theaters in support of humanitarian relief and contingency operations. - Engage in C4/Cyber and Battlespace Awareness FCBs to ensure C4ISR Directorate equities and interests are adequately addressed and to help inform the management of systems within the C4ISR portfolio. - International: Continue support to the A&S International Cooperation on multiple efforts to support NDS Strengthen Alliances and Attract New Partners. Provide support to the US FR CIWG,the NGCC with the UK, and support for the multiple other minor efforts such as Yockey waivers, review of policy issues, and support for meetings. - Execute agile development practices within DoD and Intelligence Community software driven acquisitions, including program health check and program future performance forecasting methodologies and tools and lessons learned/best practices capabilities to provide insights and recommendations to project managers and stakeholders towards improving program execution performance and inform senior steering committee meetings. - 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. - NC3: Support the NC3 Capability Portfolio Manager (CPM) with analysis presented to senior leadership bodies (NC3 Enterprise Review, Deputy's Management Action Group, SECDEF Weekly Priorities Review, etc.) and recommend investment and policy alternatives. Update NC3 program protection planning policy, NC3 cybersecurity systems engineering standards, modernization assessments, and comprehensive NC3 portfolio assessments. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Decrease from FY 2021 to FY 2022 due to FY 2021 congressional add as well as, program re-alignments.			
Accomplishments/Planned Programs Subtotals	22.562	18.341	9.345

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0604771D8Z / *Joint Tactical Information Distribution System (JTIDS)*	**Project (Number/Name)** 771 / *Link-16 Tactical Data Link (TDL) Transformation*

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 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0604771D8Z / *Joint Tactical Information Distribution System (JTIDS)*	Project (Number/Name) 771 / *Link-16 Tactical Data Link (TDL) Transformation*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 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	131.410	22.562	Jan 2020	18.341	Jan 2021	9.345	Jan 2021	-		9.345	-	-	-
		Subtotal	131.410	22.562		18.341		9.345		-		9.345	-	-	N/A

Remarks

NA

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	131.410	22.562		18.341		9.345		-		9.345	-	-	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 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0604771D8Z / *Joint Tactical Information Distribution System (JTIDS)*	**Project (Number/Name)** 771 / *Link-16 Tactical Data Link (TDL) Transformation*

	FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025				FY 2026			
	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 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0604771D8Z / *Joint Tactical Information Distribution System (JTIDS)*	**Project (Number/Name)** 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	1	2021	3	2022

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0604771D8Z / *Joint Tactical Information Distribution System (JTIDS)*	Project (Number/Name) 105 / *Cyber Capability & Platform Resilience*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
105: *Cyber Capability & Platform Resilience*	40.138	16.726	22.671	-	-	-	-	-	-	-	-	-
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 2020	FY 2021	FY 2022
Title: Cyber Capability and Platform Resilience	16.726	22.671	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0604771D8Z / *Joint Tactical Information Distribution System (JTIDS)*	**Project (Number/Name)** 105 / *Cyber Capability & Platform Resilience*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Description: FY 2020 Accomplishments: - Initiated planning for Cyber Resilience V Game in support of all Combatant Commanders. - Completed Deep Cyber Resiliency Assessment of key elements of the US Transportation Command (USTRANSCOM) Global Logistics Infrastructure. - Began DCRAs in support of USSTRATCON/AFGSC; the PNT Oversight Council; USTRANSCOM; and USEUCOM - In partnership with USCYBERCOM initiated a joint approach to strategic sensing of critical elements of the Department of Defense Weapon Systems and Critical Infrastructure. - Completed Cyber Resilience IV (28 OCT - 1 NOV) examined the cyber risks to USINDOPACOM missions that are enabled by Wideband Global SATCOM (WGS). Objectives included an assessment of the people, processes, policies and technologies associated with reducing mission risks in a cyber contested environment. - Advanced and matured tools and methodologies for conducting Deep Cyber Resiliency Assessments (DCRA). ***FY 2021 Plans:*** Goal 1: Trained and Equipped Cyber Mission Force - Continue to advance and mature capabilities for conducting mission engineering for cyberspace operations. - 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. - 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. - Manage the portfolio of DoD cyber training systems; including the DoDs PCTE and govern the PCTE as a member of the PCTE governance boards. - 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. - 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. - Advance Missions Analysis/Mission Engineering Capabilities for cyberspace operations through application of data science development of an operational level model for cyber warfare. Goal 2: Cyber Hardened Weapon Systems and Critical Infrastructure - Continue to mature and enhance the OUSD(A&S) CISO Organization			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0604771D8Z / *Joint Tactical Information Distribution System (JTIDS)*	**Project (Number/Name)** 105 / *Cyber Capability & Platform Resilience*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
- Ensure PR/MA in support of the Strategic Cybersecurity Program - Ensure execution of the evaluation of cyber vulnerabilities of DoD critical infrastructure plan. - In support of CCMDs, assess the cyber risk to Defense Critical Missions through the conduct of cyber resiliency assessments. - Reduce cyber risk to Defense Critical Missions through employment of Mission Focused Cyber Hardening Teams to prioritize and drive mitigations of critical cyber vulnerabilities. - Perform Cyber Resiliency V in coordination with Combatant Commanders, involves the execution of one large event with up to seven smaller events. - Perform Deep Cyber Resiliency Assessments (DCRAs) in conjunction with the Combatant Commanders and the CR V effort - Employ strategic sensing plan based upon results of CRs and DCRAs in collaboration with USCYBERCOM - Advance Tools and Methodologies for conducting assessing cyber risks to DoD missions Goal 3: Enhanced DIB Cybersecurity - Develop automated methods for identifying vulnerabilities of DIB partners based upon Common Vulnerabilities - Develop automated methods to monitor critical DIB partners for potential attacks and exfiltration - Develop automated methods to identify potential attacks before the cyber actor reaches the DIB partner ***FY 2022 Plans:*** Funding realigned to 0606771D8Z. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2021 to FY 2022 decrease is because this program was moved to PE: 0606771D8Z			
Accomplishments/Planned Programs Subtotals	16.726	22.671	0.000

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 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0604771D8Z / *Joint Tactical Information Distribution System (JTIDS)*	Project (Number/Name) 105 / *Cyber Capability & Platform Resilience*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Contract awards	C/CPFF	OUSD OCISO (A) : Pentagon/Mark Center	40.138	16.726		22.671		-		-		-	Continuing	Continuing	-
		Subtotal	40.138	16.726		22.671		-		-		-	Continuing	Continuing	N/A

Remarks

NA

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	40.138	16.726		22.671		-		-		-	Continuing	Continuing	N/A

Remarks

NA

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0604771D8Z / *Joint Tactical Information Distribution System (JTIDS)*	**Project (Number/Name)** 105 / *Cyber Capability & Platform Resilience*

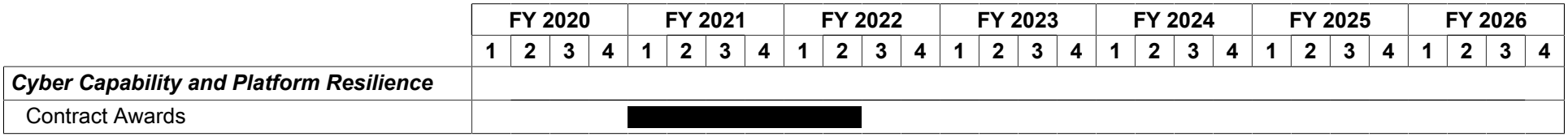


Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0604771D8Z / *Joint Tactical Information Distribution System (JTIDS)*	**Project (Number/Name)** 105 / *Cyber Capability & Platform Resilience*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Cyber Capability and Platform Resilience				
Contract Awards	1	2021	2	2022

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0604771D8Z / *Joint Tactical Information Distribution System (JTIDS)*	Project (Number/Name) 028 / *Cybersecurity: Cybersecurity Maturity Model Certification (CMMC) and Pathfinders*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
028: *Cybersecurity: Cybersecurity Maturity Model Certification (CMMC) and Pathfinders*	0.000	12.771	10.272	-	-	-	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Implement and maintain Cybersecurity Maturity Model Certification (CMMC) framework that incorporates multiple cybersecurity standards and references into a unified standard that encompasses both the progression of cybersecurity practices as well as the institutionalization of processes to secure Controlled Unclassified Information (CUI) within the Defense Industrial Base (DIB) sector. Conduct pathfinders and pilots with Services, Agencies, and international partners to support risk reduction for the phased rollout of CMMC.

Conduct pathfinders to assess and demonstrate emerging capabilities for supply chain risk management and DIB cybersecurity. Partner with the DIB sector to analyze and demonstrate promising and cost-effective capabilities and candidate solutions. Also, work with DoD stakeholders and appropriate organizations dedicated to enhancing the training and education of cybersecurity best practices to the DIB sector with an emphasis on small businesses and manufacturers.

.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: DIB Secure Cloud Managed Services Pilot	12.771	10.272	0.000
Description: FY 2020 Accomplishments: Developed CMMC Framework to include the release of the CMMC Model v1.0 to the public on January 31, 2020. Incorporated comments from DoD stakeholders, DIB sector, and public on draft versions of the CMMC Model. Developed CMMC Assessment Guides and draft training material for candidate CMMC assessors. Drafted and submitted a proposed Defense Federal Acquisition Regulation Supplement (DFARS) rule to implement CMMC across the Department in a phased rollout. Signed Memorandum of Understanding and a no-cost contract with the CMMC Accreditation Body, a non-profit entity, that specifies their roles and responsibilities with respect to the training and credentialing of individual assessors, accreditation of third-party assessment organizations, and the issuance of CMMC certificates to DIB contractors.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0604771D8Z / *Joint Tactical Information Distribution System (JTIDS)*	**Project (Number/Name)** 028 / *Cybersecurity: Cybersecurity Maturity Model Certification (CMMC) and Pathfinders*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Initiated a task order to DISA for the design, development, testing, and operations of CMMC Enterprise Mission Assurance Support Service (eMASS) database and infrastructure. Completed pathfinder that assessed the ability of commercial third-party cybersecurity vendors to provide insights into the cybersecurity posture of DIB partners through the external scanning of public facing Internet Protocol assets. The pathfinder normalized and compared the cybersecurity risk scores provided by each of the three vendors, assessed their ability to provide insights into compliance/non-compliance with a subset of DoD security requirements, and evaluated the usability of the vendors' platform and its ability to interface and port data to other systems. ***FY 2021 Plans:*** 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. 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. 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 2022 Plans:*** Funding realigned to 0606771D8Z. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2021 to FY 2022 decrease is the result of the funds being moved to a PE: 0606771D8Z.			
Accomplishments/Planned Programs Subtotals	12.771	10.272	0.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0604771D8Z / *Joint Tactical Information Distribution System (JTIDS)*	Project (Number/Name) 028 / *Cybersecurity: Cybersecurity Maturity Model Certification (CMMC) and Pathfinders*	

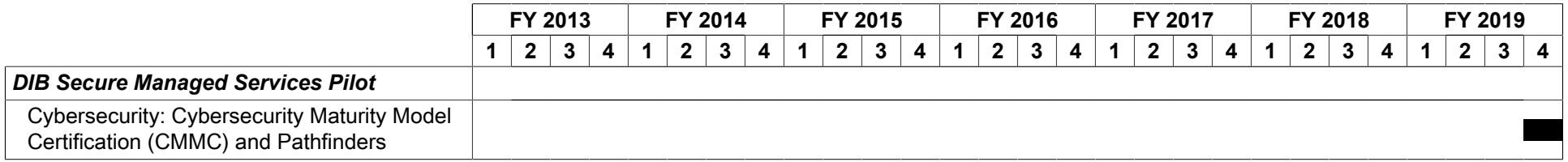
Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Management Services/ Support	C/Various	OUSD OCISO (A) : Pentagon/Mark Center	-	12.771		10.272		0.000		-		0.000	Continuing	Continuing	-
		Subtotal	-	12.771		10.272		0.000		-		0.000	Continuing	Continuing	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	12.771		10.272		0.000		-		0.000	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0604771D8Z / *Joint Tactical Information Distribution System (JTIDS)*	**Project (Number/Name)** 028 / *Cybersecurity: Cybersecurity Maturity Model Certification (CMMC) and Pathfinders*



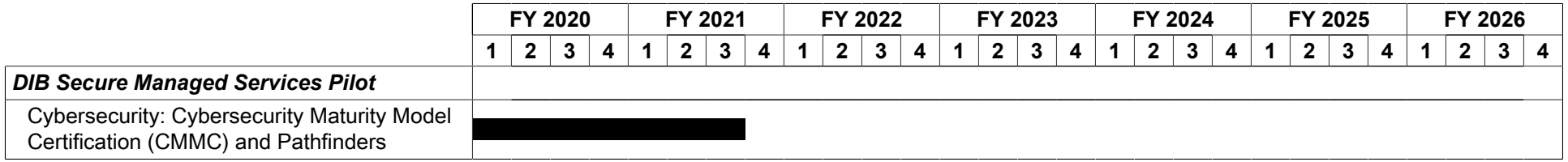


Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0604771D8Z / *Joint Tactical Information Distribution System (JTIDS)*	**Project (Number/Name)** 028 / *Cybersecurity: Cybersecurity 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 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 0605022D8Z / *Defense Exportability Features (DEF) Program*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	17.778	11.864	12.920	5.447	0.000	5.447	-	-	-	-	-	-
013: *Defense Exportability Features (DEF) Program*	17.778	11.864	12.920	5.447	0.000	5.447	-	-	-	-	-	-

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 U.S. industry share of the global marketplace.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	12.115	12.928	10.648	0.000	10.648
Current President's Budget	11.864	12.920	5.447	0.000	5.447
Total Adjustments	-0.251	-0.008	-5.201	0.000	-5.201
• Congressional General Reductions	-	-0.008			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.249	-			
• Program Adjustments	-0.002	-	-5.201	0.000	-5.201

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 0605022D8Z *I Defense Exportability Features (DEF) Program*

Change Summary Explanation

The FY 2022 funding request was reduced by $4.907 million to account for the availability of prior year execution balances.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0605022D8Z / *Defense Exportability Features (DEF) Program*	Project (Number/Name) 013 / *Defense Exportability Features (DEF) Program*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
013: *Defense Exportability Features (DEF) Program*	17.778	11.864	12.920	5.447	0.000	5.447	-	-	-	-	-	-
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.

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 U.S. industry share of the global marketplace.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: DEF Program	11.864	12.920	5.447
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 U.S. defense systems, the DoD enhances the U.S. defense industrial base, strengthens the military capabilities of U.S. allies around the world, and increases coalition interoperability.			
FY 2021 Plans: Provide follow-on funding to the Army's Indirect Fire Protection Capability Increment Two (IFPC Inc. II) and Abrams Armor programs and the Navy's Tactical Combat Training System Increment Two (TCTS II) program to continue exportability planning			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605022D8Z / *Defense Exportability Features (DEF) Program*	**Project (Number/Name)** 013 / *Defense Exportability Features (DEF) Program*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
activities. Provide initial funding to 11 other programs that the Office of the Under Secretary of Defense Acquisition and Sustainment OUSD(A&S) selected to the DEF Program between FY 2017 and FY 2021. ***FY 2022 Plans:*** Provide follow-on funding to the Army's Future Vertical Lift (FVL) program, the Navy's Enhanced Visual Acuity (EVA) and Surface Anti-Submarine Warfare (ASW) Synthetic Trainer (SAST) programs, and the Air Force's Skyborg, Astro-Standards, and Integrated Solutions for Situation Awareness (ISSA) programs. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The FY 2022 funding was decreased to account for the availability of prior year execution balances and to support departmental priorities.			
Accomplishments/Planned Programs Subtotals	11.864	12.920	5.447

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0605022D8Z / *Defense Exportability Features (DEF) Program*	Project (Number/Name) 013 / *Defense Exportability Features (DEF) Program*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
DEF	TBD	Various : Various	17.778	11.864		12.920		5.447		-		5.447	-	-	-
		Subtotal	17.778	11.864		12.920		5.447		-		5.447	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	17.778	11.864		12.920		5.447		-		5.447	-	-	N/A

Remarks

N/A

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605022D8Z / *Defense Exportability Features (DEF) Program*	**Project (Number/Name)** 013 / *Defense Exportability Features (DEF) Program*

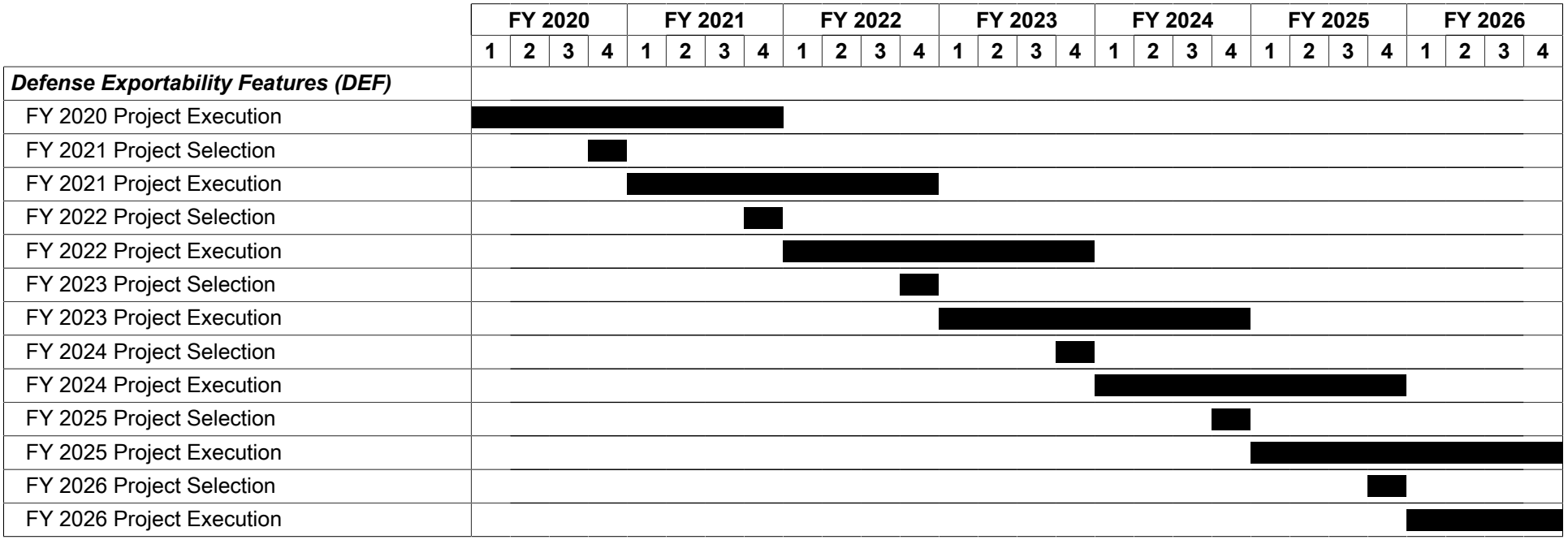


Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605022D8Z / *Defense Exportability Features (DEF) Program*	**Project (Number/Name)** 013 / *Defense Exportability Features (DEF) Program*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Defense Exportability Features (DEF)				
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	2026
FY 2026 Project Selection	4	2025	4	2025
FY 2026 Project Execution	1	2026	4	2026

THIS PAGE INTENTIONALLY LEFT BLANK

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 0605027D8Z / *OUSD(C) IT Development Initiative*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	86.665	9.238	10.259	16.892	-	16.892	-	-	-	-	-	-
927: *Next Generation Resource Management System*	41.203	4.800	4.221	4.293	-	4.293	-	-	-	-	-	-
930: *Advanced Analytics (Advana)*	45.462	4.438	6.038	12.599	-	12.599	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

As the Department of Defense's 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 Systems (NGRMS):
The 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 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.

The 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.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 0605027D8Z / *OUSD(C) IT Development Initiative*

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

To date, a prototype has been fully developed, deployed and is continuously being tested by two major components (Army & DARPA). 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.

Advanced Analytics (Advana):
Advana is a technology platform which, not only houses a collection of enterprise data, but expands the boundaries of a standard data warehouse by arming military and business decision-makers with decision support analytics, visualizations, and data tools. We have positioned Advana as a pivotal asset to enable the OUSD(C)’s “CFO of the Future” vision and support the DoD Data Strategy, both aimed at achieving the National Defense Strategy by advancing analytics throughout the DoD. Advana directly supports the DoD’s financial statement audit as the single repository for financial accounting data across the Department and services numerous other analytical use cases aligned to the National Defense Strategy.

Advana provides:
•A managed data service for acquiring, tagging, securing, transforming and centralizing core business and readiness data assets to support Enterprise Reporting and Analytics
•A shared infrastructure that provides scalable and highly performant cloud compute and storage across multiple networks and security boundaries
•Tools and capabilities to enable self-service analytics and data science across the Department

The failure to meet these requirements will result in the Department being unable to successfully conduct and pass an audit and set senior leaders back years in being able to take advantage of Common Enterprise Data to make strategic decisions.

Advana’s very beginnings were for the purpose of supporting OUSD(C) as the DoD financial reporting authority by creating a single platform where audit, financial reporting, and compliance monitoring could occur. Advana achieved this by establishing a common repository of enterprise data that opens the door for a larger opportunity to use this data to support advanced performance management analytics and generate insights that matter to executive sponsors. To date, investments have been used for developing and deploying a cloud-based data platform, complete with COTS analytics tools and web applications that are needed to reconcile financial transactions, review obligations, and significantly improve DoD’s financial management practices.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 0605027D8Z *I OUSD(C) IT Development Initiative*

In 2020, Advana has proven itself as an enterprise-wide data analytics solution that has capabilities far beyond the original financial management scope. For example, DoD's COVID-19 response efforts, leveraging the DoD-owned Advana platform, have successfully demonstrated how a department-wide, collaborative response to a crisis can result in the rapid removal of organizational barriers, accelerate data exploration, and drive tremendous value for decision makers tasked with ensuring the safety, availability, and operational readiness of the DoD's resources.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	9.590	10.259	10.592	-	10.592
Current President's Budget	9.238	10.259	16.892	-	16.892
Total Adjustments	-0.352	0.000	6.300	-	6.300
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.352	-			
• Program Enhancement	-	-	6.300	-	6.300

Change Summary Explanation

The program enhancement in FY 2022 is to support an increase in the data storage resources and contractor cloud engineering staff required to develop across three domains as well as anticipate increases in user licenses, tools to support enterprise-wide analytics, and subject matter expertise needed to develop and expand the security and user management for these environments.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0605027D8Z / *OUSD(C) IT Development Initiative*	Project (Number/Name) 927 / *Next Generation Resource Management System*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
927: *Next Generation Resource Management System*	41.203	4.800	4.221	4.293	-	4.293	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

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 that include the following:
- 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

To date, a prototype has been fully developed, deployed, and is continuously being tested by two major components (Army & DARPA). 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.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Next Generation Resource Management System	4.800	4.221	4.293

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605027D8Z / *OUSD(C) IT Development Initiative*	**Project (Number/Name)** 927 / *Next Generation Resource Management System*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
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. ***FY 2021 Plans:*** FY 2021 planned development will include the continued development, developmental and operational test, and deployment of the production interfaces (including a pilot with end-users, during the FY 2022 President's Budget submission). Development of a cloud environment for the migration and deployment of the system is also planned and incremental deployment and the continuous development and testing of the reporting/analytic tool began in FY 2021. ***FY 2022 Plans:*** FY 2022 planned development will include all necessary cyber security enhancements, the full integration of the CAPE Manpower Tool and various iterative development initiatives in support of the changing budget requirements. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Inflation and additional end-users of the Program/Budget Analytics tool (Qlik) drive the increase, as well as, incremental development and the continuous development and testing of required enhancements.			
Accomplishments/Planned Programs Subtotals	4.800	4.221	4.293

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 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0605027D8Z / *OUSD(C) IT Development Initiative*	Project (Number/Name) 927 / *Next Generation Resource Management System*	

Product Development ($ in Millions)

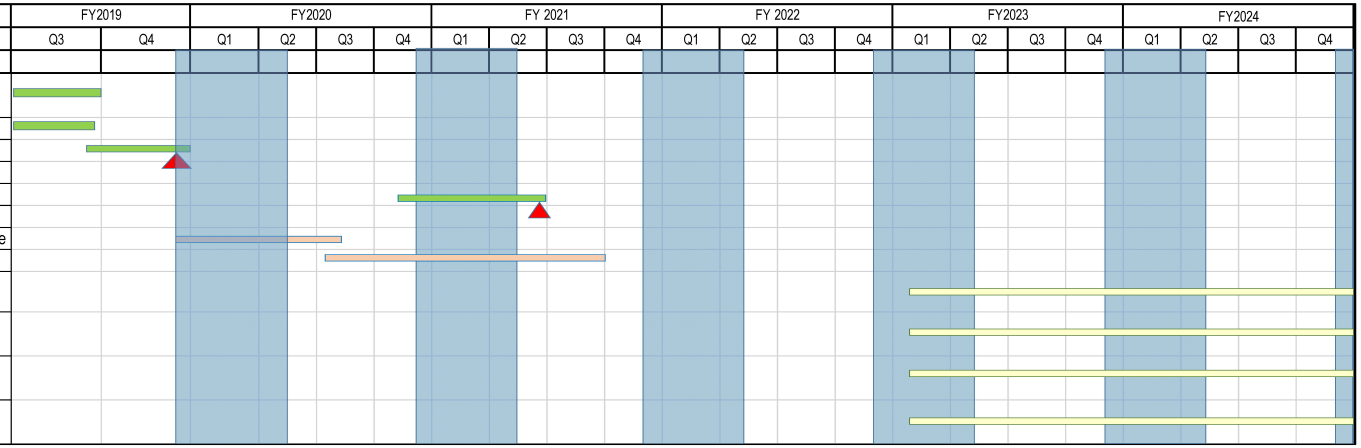
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Development	C/TBD	OUSD(C) : Pentagon & Contractor Off-site Facility	41.203	4.800	Sep 2019	4.221		4.293		-		4.293	Continuing	Continuing	-
		Subtotal	41.203	4.800		4.221		4.293		-		4.293	Continuing	Continuing	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	41.203	4.800		4.221		4.293		-		4.293	Continuing	Continuing	N/A

Remarks

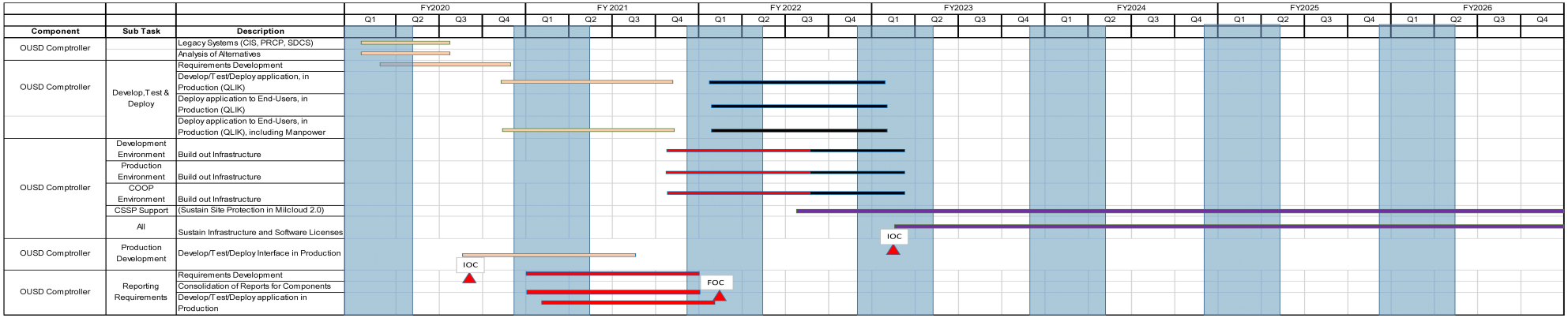
Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605027D8Z / *OUSD(C) IT Development Initiative*	**Project (Number/Name)** 927 / *Next Generation Resource Management System*

Task	Component	Sub Task	Description
Single Submission	OUSD Comptroller	Acquisition	Develop Single Submission Statement of Objectives
			Develop Acquisition Strategy
			Complete Acquisition
			Award Contract
			Complete 2nd Acquisition
			Award 2nd Contract
	OUSD Comptroller	Prototype Development	Develop Single Submission Prototype
			Test/Deploy Prototype
	OUSD Comptroller	Iterative Development Initiatives	Continuous development to support changing budget requirements
			NIP Controls, based on changing requirements
			Diagnostic/Tie Point Reports, based on changing requirements
	OUSD Comptroller/CAPE		Integrations with Manpower updates, baed on changing requirements



NGRMS Funding Legend	
Government Personnel	
FY20 RDT&E Funds	
FY23 and Out RDT&E Funds	

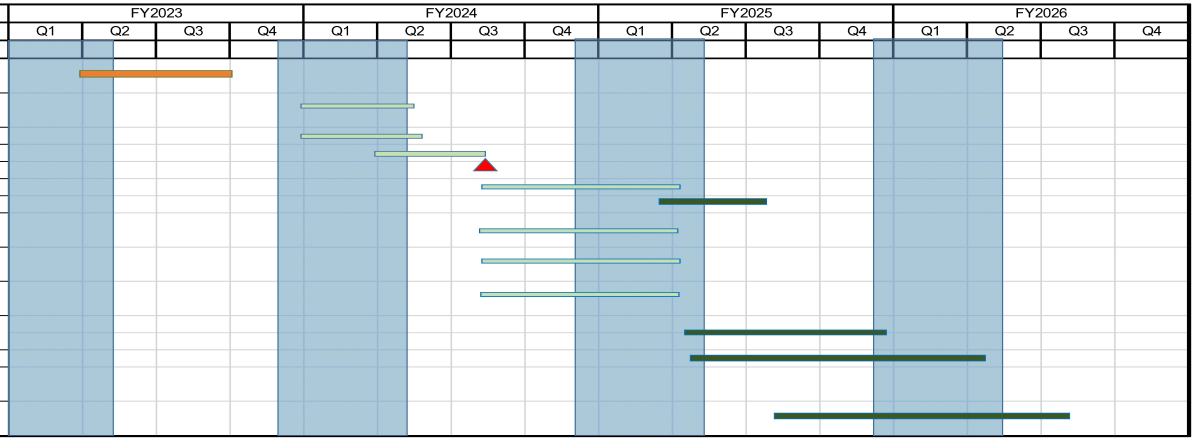
Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605027D8Z / *OUSD(C) IT Development Initiative*	**Project (Number/Name)** 927 / *Next Generation Resource Management System*



NGRMS Funding Legend	
FY20 RDT&E Funds	
FY21 and out O&M	
FY21 RDT&E Funds	
FY22 RDT&E Funds	

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605027D8Z / *OUSD(C) IT Development Initiative*	**Project (Number/Name)** 927 / *Next Generation Resource Management System*

Task	Component	Sub Task	Description
Tie in Enactment / Accounting Systems	OUSD Comptroller		Analysis of Alternatives
B2A/EFD NGRMS	OUSD Comptroller	Acquisition	Develop B2A/EFD to NGRMS Performance Work Statement
			Develop Acquisition Strategy
			Complete Acquisition
			Award Contract
		Prototype Development	Develop B2A/EFD Prototype
			Test/Deploy B2A/EFD Prototype
B2A/EFD MILCloud Infrastructure	OUSD Comptroller	Development Environment	Build out Infrastructure
		Production Environment	Build out Infrastructure
		COOP Environment	Build out Infrastructure
Complete B2A/EFD Production Interfaces	OUSD Comptroller	Production Development	Develop/Test/Deploy Interface in Production
	OUSD Comptroller	Reporting Requirements	Requirements Development
			Consolidation of Reports for Components
			Develop/Test/Deploy application in Production



NGRMS Funding Legend	
FY23 RDT&E Funds	
FY24 and Out RDT&E Funds	
FY25 and Out RDT&E Funds	

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605027D8Z / *OUSD(C) IT Development Initiative*	**Project (Number/Name)** 927 / *Next Generation Resource Management System*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
NGRMS				
Single Submission	3	2018	4	2026
Database Consolidation	1	2020	4	2020
Data Analytics	1	2020	4	2021
MilCloud Infrastructure	4	2021	1	2023
Complete Single Submission Product Interfaces	3	2020	3	2021
Tie in Enactment/Accounting System	2	2023	3	2023
B2A/EFD NGRMS	1	2024	1	2025
B2A/EFD MILCloud Infrastructure	3	2024	1	2025
Complete B2A/EFD Production Interfaces	2	2025	3	2026

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0605027D8Z / *OUSD(C) IT Development Initiative*	Project (Number/Name) 930 / *Advanced Analytics (Advana)*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
930: *Advanced Analytics (Advana)*	45.462	4.438	6.038	12.599	-	12.599	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Department of Defense is currently facing an unprecedented set of operating challenges. An increasingly complex security environment, aggression from adversaries in every operating domain, and a diminished current readiness posture caused by both persistent armed conflict and the COVID-19 pandemic, which has threatened the health and welfare of the Department's greatest asset, its military and civilian workforce. In the past, it was nearly impossible for a single DoD data platform to meet the demand for the enterprise-wide common operating pictures (COPs) needed to deliver strategic insights based on timely data to help address these challenges. However, in 2020, the Advana program has proven that it is uniquely positioned as a strategic asset and critical enabler for modernizing the data and analytics culture at DoD, providing effortless access to data and tools with the transparency required to rapidly understand results and make decisions in support of the National Defense Strategy priorities.

Advana provides a single repository for Common Enterprise Data to support the TI97 General Fund for the 4th Estate. Without Advana, the Department will be incapable of asserting readiness for an independent audit of the consolidated financial statements. Advana is positioned to support all DoD organizations pursuing unmodified opinions on their full financial statement audits. Without an automated capability to provide a transactional universe for sampling and related evidentiary proof, the Department will not be in compliance with public law.

Since 2020, Advana has supported more than 19,000 users across 82 DoD organizations, providing access to data from more than 200 DoD systems across all common enterprise data domains, including Readiness, Procurement, Personnel, Acquisition, Supply Chain, Logistics, Health, Information Technology, Financial Management, Budget, Cost Management, and many more. Using Advana's central data platform with right-time data, data tools, and other self-service products, leaders are simplifying solutions and putting the power of analytics in the pocket of every analyst and decision-making authority at the DoD. For example, DEPSECDEF has begun requiring the use of Advana for certain senior level briefings, to include the Deputy's Management Action Group (DMAG) and the Secretary's Weekly Priority Review (SWPR).

The requested funds will be used to buy "Big Data" software, hardware infrastructure, and required contractor services to develop, test, and implement the technology to meet the expanding requirements. 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.

Going forward, the Advana data platform seeks to continue serving as the DoD's enterprise-level analytics solution and expand to over 100,000 users and 300 systems. Additional investment will allow Advana to continue supporting programmatic growth, including infrastructure enhancements, additional analytical tools, and the subject matter experts needed to develop these critical resources. Together, we will harness the power of DoD's enterprise data to help transform all functions of the

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605027D8Z / *OUSD(C) IT Development Initiative*	**Project (Number/Name)** 930 / *Advanced Analytics (Advana)*

Department thereby, protecting DoD's workforce, safeguarding U.S. citizens, defending allies and partners, and improving the affordability, effectiveness, and speed of our operations.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Advanced Analytics (Advana)	4.438	6.038	12.599
Description: Over the next two fiscal years, Advana is committed to ensuring that a performant, secure, flexible, enterprise-wide data analytics solution is available for the DoD analyst community. This includes providing cloud-based environments and COTS tool options on NIPR, SIPR, and JWICS, as well as having trained service desk staff, data scientists, and a managed data service team available to assist users, as needed. Funds will be used to support increments thirteen through eighteen, per the schedule, as described below. ***FY 2021 Plans:*** FY 2021 plans continue the development and expansion of multi-domain analytics environments with the migration of the on-premise SIPR USMC instance to AWS GovCloud. This will include the development of a cross domain solution, configuration of the security protocols, analytics tools, and data storage needed to support classified data analysis. Further, additional enhancements are planned for both environments, such as containerization (i.e., decoupling applications to improve productivity), full development of two data science capabilities, enhancement to Advana's data status tracker, and migration away from the Cloudera cluster to take advantage of efficiencies and solutions available from AWS. ***FY 2022 Plans:*** FY 2022 plans will allow for development and expansion of Advana's planned JWICS Cloud environment, which will enable additional highly classified data analysis with similar analytics tools seen on the NIPR and SIPR environments. Additionally, the team will continue expanding the number of solutions available on all environments, expanding/enhancing security controls, and expand the number of DoD stakeholders served. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Given the anticipated development and expansion of the environments in which Advana operates, to include a larger SIPR presence and JWICS cloud instance, we anticipate an increase in the data storage resources and contractor cloud engineering staff required to develop across three domains. We also anticipate increases in user licenses, tools to support enterprise-wide analytics, and subject matter expertise needed to develop and expand the security and user management for these environments.			
Accomplishments/Planned Programs Subtotals	4.438	6.038	12.599

C. Other Program Funding Summary ($ in Millions)

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605027D8Z / *OUSD(C) IT Development Initiative*	**Project (Number/Name)** 930 / *Advanced Analytics (Advana)*

C. Other Program Funding Summary ($ in Millions)

Remarks

D. Acquisition Strategy

Leverage existing contracts to continue agile development..

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605027D8Z / *OUSD(C) IT Development Initiative*	**Project (Number/Name)** 930 / *Advanced Analytics (Advana)*

Product Development ($ in Millions)

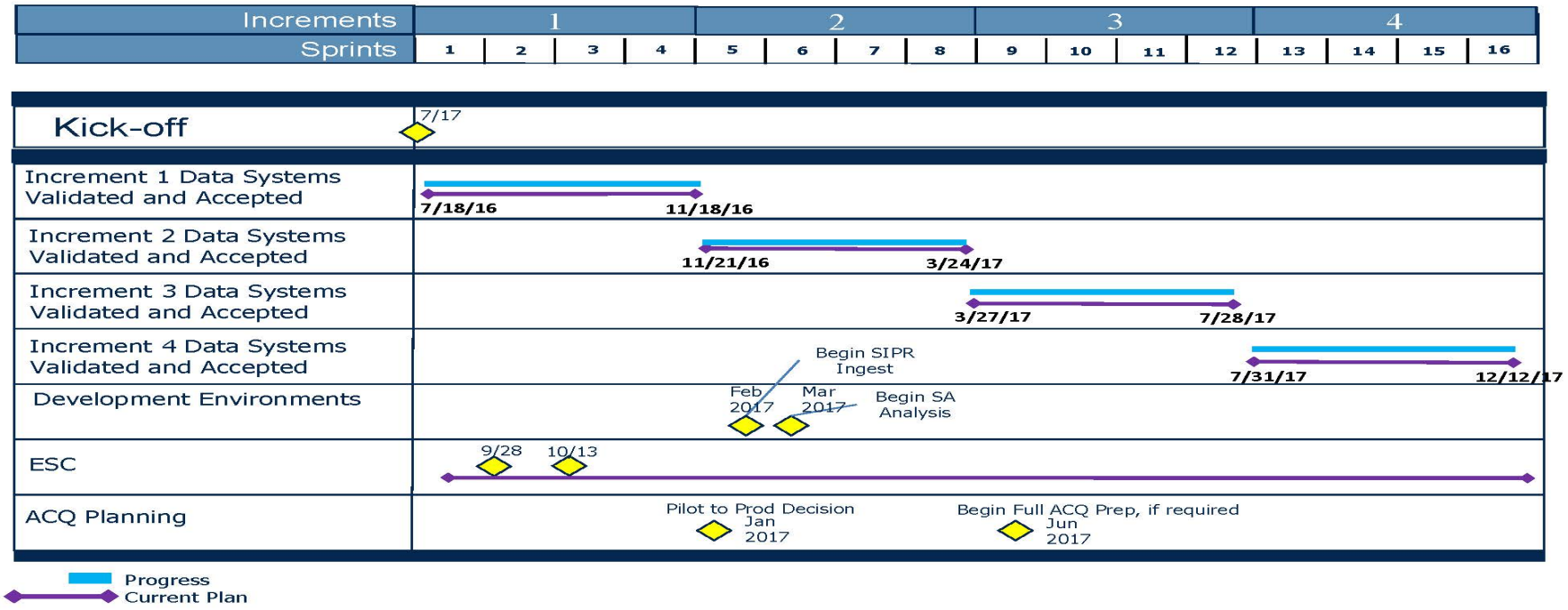
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Development	C/TBD	OUSD(C) : Pentagon	45.462	4.438	Aug 2019	6.038	Aug 2021	12.599		-		12.599	Continuing	Continuing	-
		Subtotal	45.462	4.438		6.038		12.599		-		12.599	Continuing	Continuing	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	45.462	4.438		6.038		12.599		-		12.599	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605027D8Z / *OUSD(C) IT Development Initiative*	**Project (Number/Name)** 930 / *Advanced Analytics (Advana)*

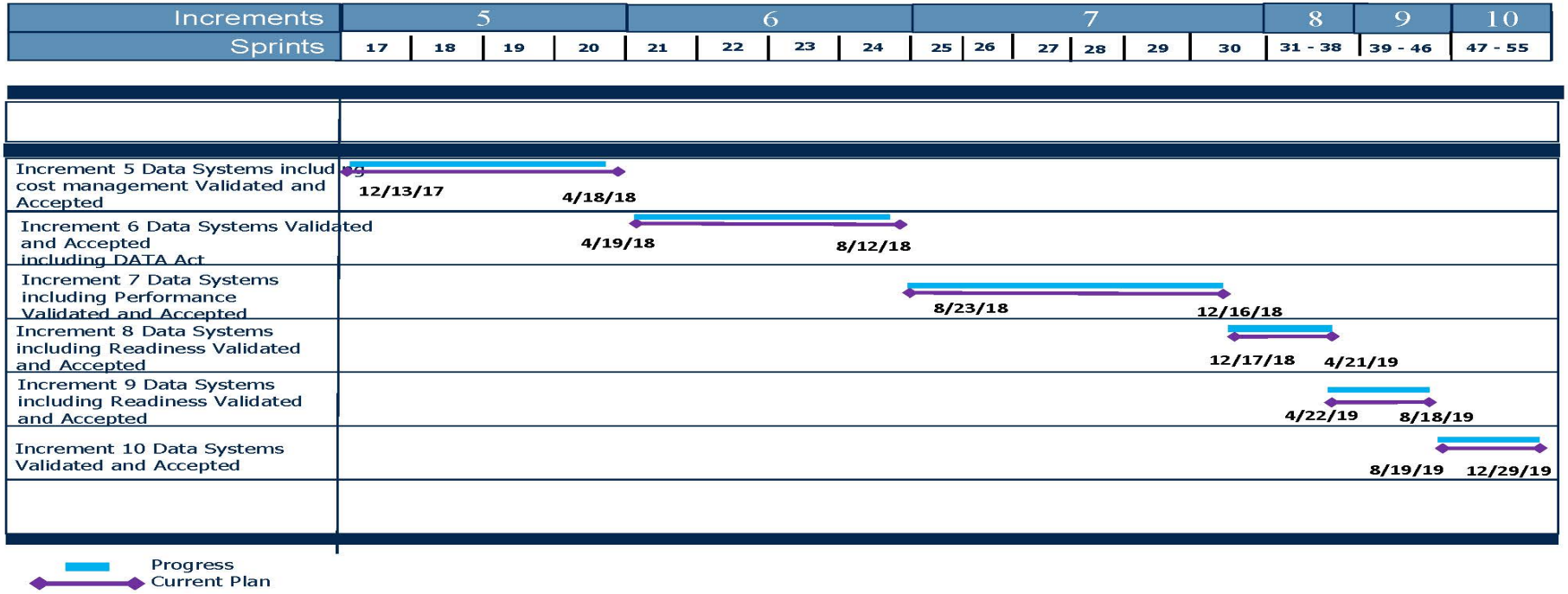
ADVANA Schedule Overview



Slide: 1

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605027D8Z / *OUSD(C) IT Development Initiative*	**Project (Number/Name)** 930 / *Advanced Analytics (Advana)*

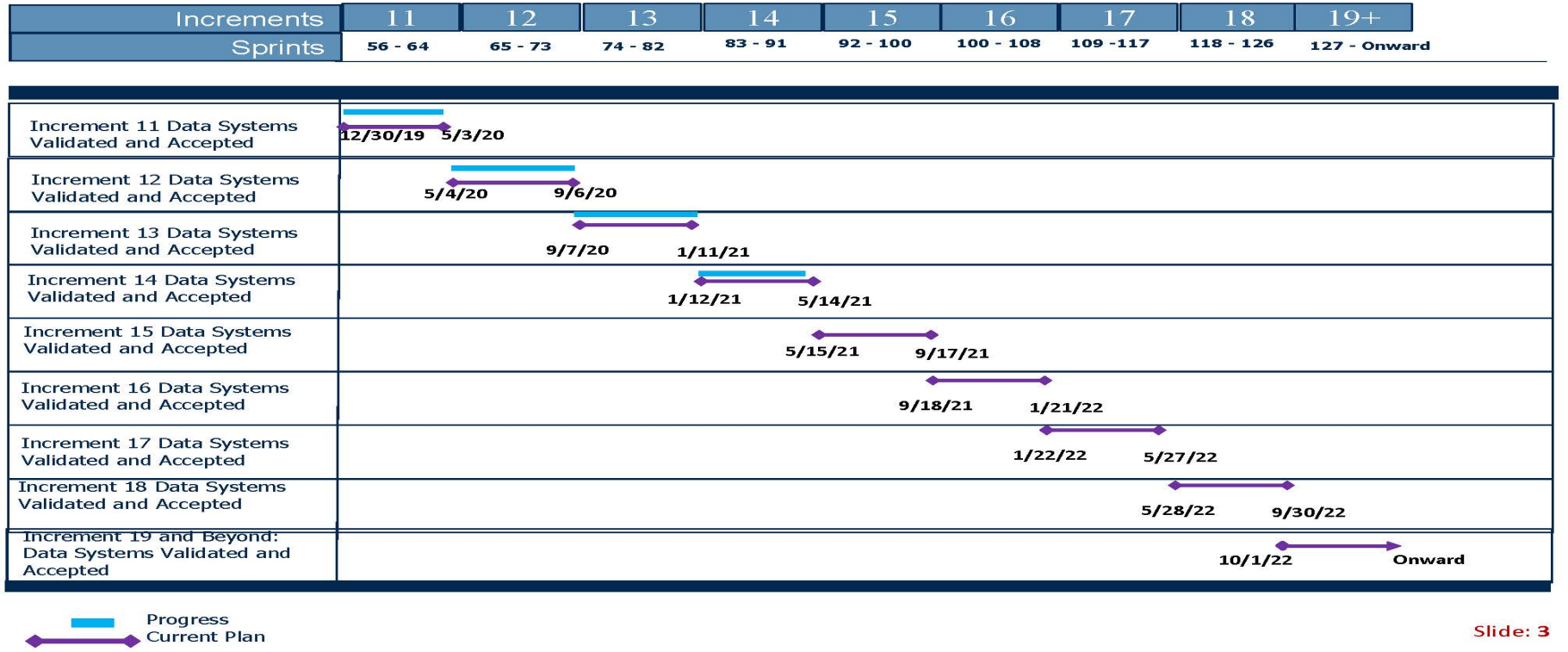
ADVANA Schedule Overview Cont.



Slide: 2

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605027D8Z / *OUSD(C) IT Development Initiative*	**Project (Number/Name)** 930 / *Advanced Analytics (Advana)*

ADVANA Schedule Overview Cont.



Slide: 3

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605027D8Z / *OUSD(C) IT Development Initiative*	**Project (Number/Name)** 930 / *Advanced Analytics (Advana)*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Acquisiiton Milestone				
Development and ingest further data	3	2021	4	2026

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 0605075D8Z / *CMO Policy and Integration*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	95.145	1.618	1.618	0.000	-	0.000	-	-	-	-	-	-
075: *CMO Policy and Integration*	95.145	1.618	1.618	0.000	-	0.000	-	-	-	-	-	-

Note

Starting in FY 2022 the Office of the Chief Management Officer (CMO) will be disestablished and funding and man-power resources realigned to the DA&M.

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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	1.618	1.648	1.675	-	1.675
Current President's Budget	1.618	1.618	0.000	-	0.000
Total Adjustments	0.000	-0.030	-1.675	-	-1.675
• Congressional General Reductions	-	-0.030			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Program Adjustment	-	-	-1.675	-	-1.675

Change Summary Explanation

Starting in FY 2022 CMO will be disestablished and funding and man-power resources realigned to the DA&M.
The FY 2022 funding request was reduced by $0.410 million to account for the availability of prior year execution balances.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0605075D8Z / *CMO Policy and Integration*	Project (Number/Name) 075 / *CMO Policy and Integration*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
075: *CMO Policy and Integration*	95.145	1.618	1.618	0.000	-	0.000	-	-	-	-	-	-
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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Title: CMO Policy and Integration	1.618	1.618	0.000	0.000	0.000
Description: - Defined and developed engineering and information technology development plans - Established acquisition strategy and detailed implementation schedule - Vetted project plan and implementation goals objectives and outcomes within the Defense Business Council ***FY 2021 Plans:*** - Deliver Defense Business Council goals objectives and outcomes - 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: -Test BEA Improvements initial operating capability to integrate with CMO responsibilities as the CIO for Defense Business Systems. -Troubleshoot DoD cloud service provider BEA initial hosting configuration, operational performance and stage potential hosting environment transition to JEDI shared service solution. -Mature and support transition of business intelligence and analytics (BIA) capabilities to DoD Chief Data Officer big data analytics environment. -Improve BEA integration and visibility of ongoing DoD Reform initiatives. ***FY 2022 Base Plans:*** Starting in FY 2022 CMO will be disestablished and funding and man-power resources realigned to the DA&M. ***FY 2022 OCO Plans:***					

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605075D8Z / *CMO Policy and Integration*	**Project (Number/Name)** 075 / *CMO Policy and Integration*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
N/A ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Starting in FY 2022 CMO will be disestablished and funding and man-power resources realigned to the DA&M. The FY 2022 funding request was reduced by $0.410 million to account for the availability of prior year execution balances.					
Accomplishments/Planned Programs Subtotals	1.618	1.618	0.000	0.000	0.000

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 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605075D8Z / *CMO Policy and Integration*	**Project (Number/Name)** 075 / *CMO Policy and Integration*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 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	-		0.618		-		-		-	-	-	-
Extend user access to BEA via web services	Option/ CPFF	DCMO : Mark Center	4.905	1.300		0.500		-		-		-	-	-	-
Port BEA into Cloud evironment	Option/ CPFF	DCMO : Mark Center	90.240	0.318		0.500		-		-		-	-	-	-
		Subtotal	95.145	1.618		1.618		-		-		-	-	-	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 and updated capabilities to the EKR shared services environment which is an accredited DoD computing environment. The discover functionality is operating in the contractor's development environment and is in the process of transitioning to final hosting within the EKR 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 FY 2020. However, due to the DSD memorandum dated 24 January 2020 directing a complete review of the 4th Estate the transition was delayed until late 2021/early 2022.

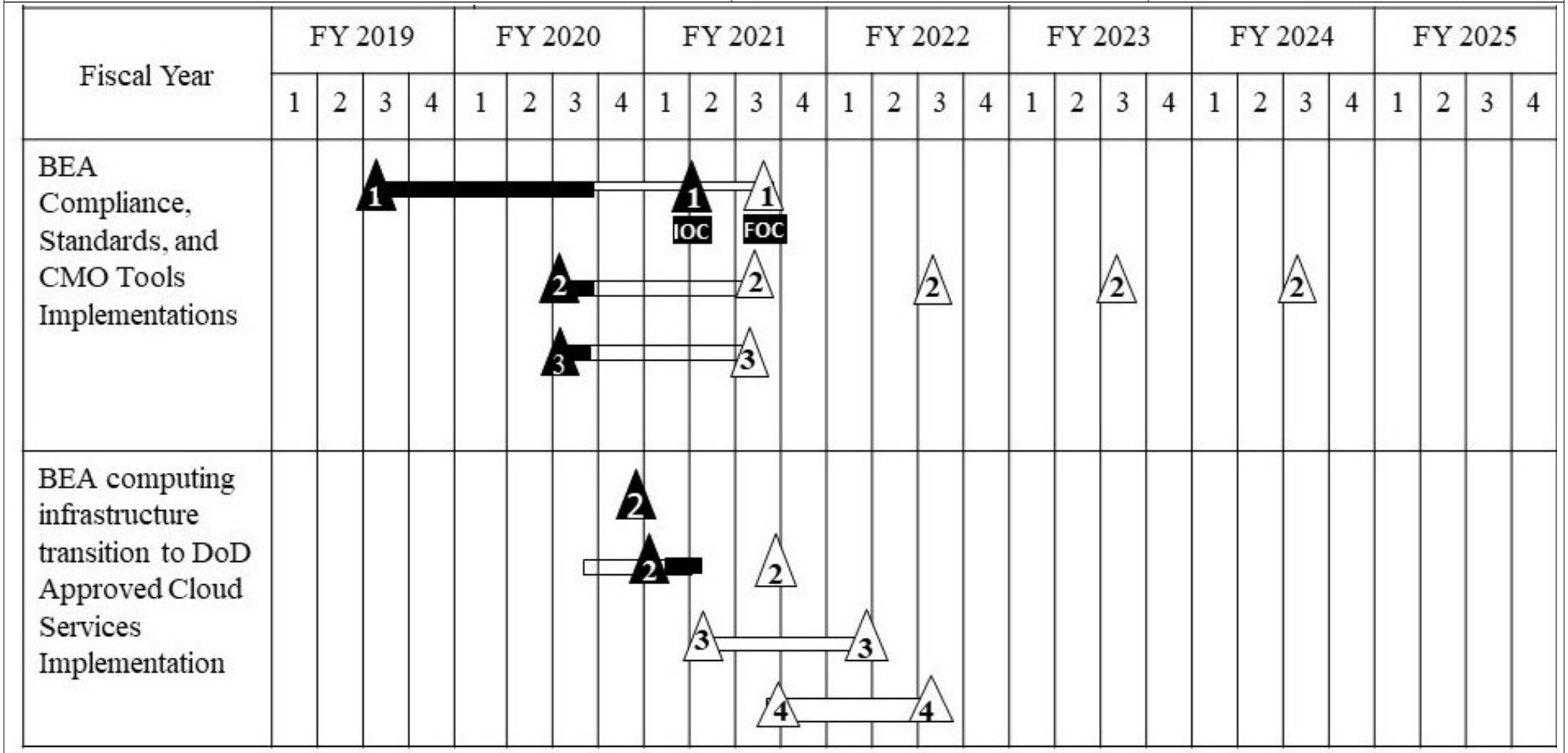
-The Business Enterprise Architecture is related to NDS Strategic Approach number three "Reform the Department for Greater Performance and Affordability" regarding, Streamline rapid, iterative approaches from development to fielding.

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	95.145	1.618		1.618		-		-		-	-	-	N/A

Remarks

NA

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605075D8Z / *CMO Policy and Integration*	**Project (Number/Name)** 075 / *CMO Policy and Integration*



THIS PAGE INTENTIONALLY LEFT BLANK

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 0605210D8Z / *Defense-Wide Electronic Procurement Capabilities*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	85.038	8.995	8.274	7.148	-	7.148	-	-	-	-	Continuing	Continuing
021: *Defense-Wide Electronic Procurement Capabilities-Contingency*	85.038	8.995	8.274	7.148	-	7.148	-	-	-	-	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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	9.619	8.279	7.286	-	7.286
Current President's Budget	8.995	8.274	7.148	-	7.148
Total Adjustments	-0.624	-0.005	-0.138	-	-0.138
• Congressional General Reductions	-	-0.005			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-0.271	-			
• SBIR/STTR Transfer	-0.353	-			
• Program Adjustments	-	-	-0.138	-	-0.138

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0605210D8Z / *Defense-Wide Electronic Procurement Capabilities*	Project (Number/Name) 021 / *Defense-Wide Electronic Procurement Capabilities- Contingency*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
021: *Defense-Wide Electronic Procurement Capabilities- Contingency*	85.038	8.995	8.274	7.148	-	7.148	-	-	-	-	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 2020	FY 2021	FY 2022
Title: Defense-Wide Electronic Procurement Capabilities- Contingency	8.995	8.274	7.148
Description: FY 2020 Accomplishments: 1) Improved DoD's Joint Appointment Module (JAM) for management of Contracting Officer Representative (COR) and the Government Purchase Card (GPC) appointments to provide (1) complete access for CORs and DCAA auditors to share data on cost contracts, and (2) capturing office identification to facilitate more accurate FPDS reporting when GPC cardholders buy through FedMall. 2) Enhanced the Government Furnished Property (GFP) Module improving data reporting and aggregation across the process to better track serially managed items end-to-end. The GFP module was also enhanced to allow users to leverage spreadsheets to generate shipments and receipts as a way to improve adoption and usability. 3) Developed the first versions of the Catalog data standard whereby vendors can communicate their catalog offerings with DoD in a standard, repeatable method 4) Created a new feature within Electronic Data Access (EDA) to capture vendor's commercial catalogs as data and share with DoD users through both a web lookup feature and through system to system connections. 5) Significantly improved the Procurement Integrated Enterprise Environment (PIEE) access controls generating a single account management layer and common business rules across the five business areas that utilize PIEE while also revamping the user hierarchy to comply with federal reporting requirements.			
FY 2021 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605210D8Z / *Defense-Wide Electronic Procurement Capabilities*	**Project (Number/Name)** 021 / *Defense-Wide Electronic Procurement Capabilities- Contingency*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
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. ***FY 2022 Plans:*** FY 2022 plans continue to focus on improving the identification and tracking of government furnished property and resolving audit findings. DPC will also focus on continued implementation of the purchase request, procurement, and catalog data standards. Additional standard development will focus on other transactions. Further develop the modules in the Procurement Integrated Enterprise Environment (PIEE) to use the catalog data standard to drive better product and pricing identification. Continue to enhance supply chain risk data mining. Leverage robotics and automation efforts for streamlining procurement processes and expanding data mining. Develop enterprise requirements coming from emerging statutes and regulations for the fourth estate contract writing capability. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2021 to FY 2022 decrease is the result of planned program adjustments.			
Accomplishments/Planned Programs Subtotals	8.995	8.274	7.148

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0605210D8Z / *Defense-Wide Electronic Procurement Capabilities*	Project (Number/Name) 021 / *Defense-Wide Electronic Procurement Capabilities- Contingency*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Contract Business Systems Development	Various	DLA, JTIC, WPAFB : FORT BELVOIR, SCOTT AFB	80.759	8.995		8.274		7.148		-		7.148	-	-	-
		Subtotal	80.759	8.995		8.274		7.148		-		7.148	-	-	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Interoperability Testing	Various	DLA, JTIC, WPAFB : FORT BELVOIR, SCOTT AFB	4.279	-		-		-		-		-	-	-	-
		Subtotal	4.279	-		-		-		-		-	-	-	N/A

	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	85.038	8.995		8.274		7.148		-		7.148	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605210D8Z / *Defense-Wide Electronic Procurement Capabilities*	**Project (Number/Name)** 021 / *Defense-Wide Electronic Procurement Capabilities- Contingency*

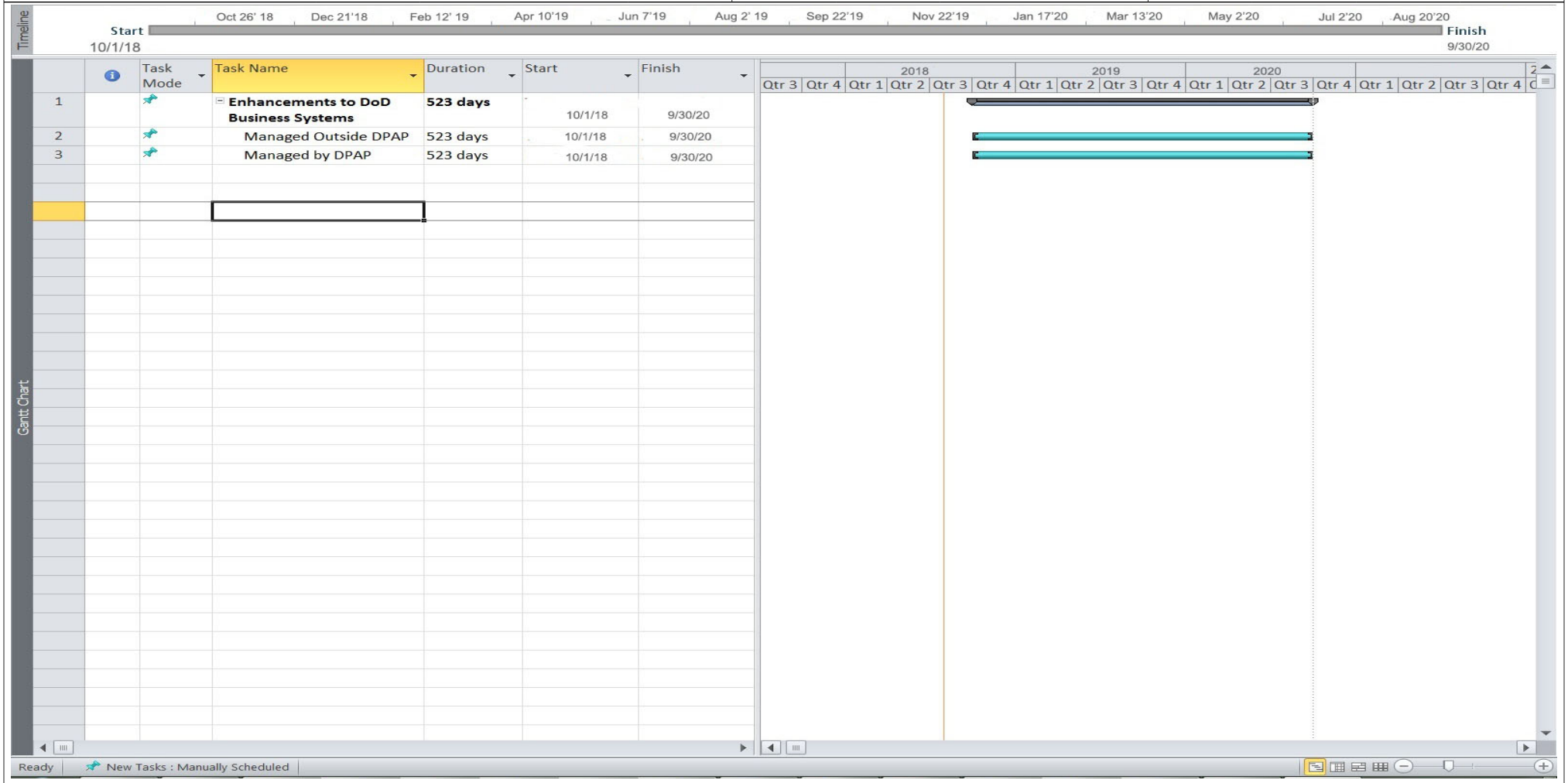


Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605210D8Z / *Defense-Wide Electronic Procurement Capabilities*	**Project (Number/Name)** 021 / *Defense-Wide Electronic Procurement 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 2022 Office of the Secretary Of Defense											Date: May 2021	
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 5: *System Development & Demonstration (SDD)*					R-1 Program Element (Number/Name) PE 0605294D8Z / *Trusted and Assured Microelectronics*							
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
Total Program Element	154.133	170.849	107.513	113.895	-	113.895	-	-	-	-	-	-
812: *Trusted Mask Trust Approach*	2.000	2.000	0.000	0.000	-	0.000	-	-	-	-	-	-
809: *New Trust Approach Demonstration*	72.479	13.381	0.000	0.000	-	0.000	-	-	-	-	-	-
822: *Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) Enhancement and Demonstration*	79.654	155.468	0.000	0.000	-	0.000	-	-	-	-	-	-
902: *Access to State-of-the-Art (SOTA) Microelectronics - Demonstration*	0.000	0.000	54.045	51.298	-	51.298	-	-	-	-	-	-
903: *Access to Advanced Packaging and Testing - Demonstration*	0.000	0.000	39.040	41.797	-	41.797	-	-	-	-	-	-
905: *Address DoD Unique Needs Especially Radiation Hardening - Demonstration*	0.000	0.000	14.428	20.800	-	20.800	-	-	-	-	-	-

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 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*

This Program Element supports the OUSD(R&E) Microelectronics Modernization Roadmap. The primary areas of focus of this roadmap include the following: access to state-of-the-art (SOTA) microelectronics technology, 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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	175.032	107.585	115.315	-	115.315
Current President's Budget	170.849	107.513	113.895	-	113.895
Total Adjustments	-4.183	-0.072	-1.420	-	-1.420
• Congressional General Reductions	-	-0.072			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-4.153	-			
• Program Adjustment	-	-	-1.420	-	-1.420
• Cancelled Account Reduction	-0.030	-	-	-	-

Change Summary Explanation

In FY 2021, Project Code 812 "Trusted Mask" was eliminated. Project 809 "New Trust Demonstration" and Project Code 822 "Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC)" activities were re-aligned under three new project codes to correctly align Program Element (PE) funding in support of a Quantifiable Assurance philosophy and reflective of current priorities. The new project codes are: (1) Project Code 902 Access to State-of-the-Art (SOTA) Microelectronics - Demonstration; (2) Project Code 903 Access to Advanced Packaging and Testing - Demonstration; and (3) Project Code 905 Address DoD Unique Needs Especially Radiation Hardening - Demonstration.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0605294D8Z / *Trusted and Assured Microelectronics*	Project (Number/Name) 812 / *Trusted Mask Trust Approach*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
812: *Trusted Mask Trust Approach*	2.000	2.000	0.000	0.000	-	0.000	-	-	-	-	-	-
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 2020	FY 2021	FY 2022
Title: Trusted Mask Trust Approach ***Description:*** Funding for this effort ended in FY 2020.	2.000	-	-
Accomplishments/Planned Programs Subtotals	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 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 812 / *Trusted Mask Trust Approach*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Trusted Mask Trust Approach	MIPR	Defense Microelectronics Activity (DMEA) : California	2.000	2.000	Mar 2020	-		-		-		-	-	-	-
		Subtotal	2.000	2.000		-		-		-		-	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	2.000	2.000		0.000		-		-		-	-	-	N/A

Remarks

NA

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 812 / *Trusted Mask Trust Approach*

	FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025				FY 2026			
	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
Trusted mask facility operation																												
Trusted mask facility operation	[redacted]																											

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 812 / *Trusted Mask Trust Approach*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Trusted mask facility operation				
Trusted mask facility operation	1	2020	4	2020

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0605294D8Z / *Trusted and Assured Microelectronics*	Project (Number/Name) 809 / *New Trust Approach Demonstration*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
809: *New Trust Approach Demonstration*	72.479	13.381	0.000	0.000	-	0.000	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In FY 2021, P809 funds transferred from this project code (Pcode) to new P902 “Access to SOTA Microelectronics Demonstration” to properly align funding in support of the Quantifiable Assurance philosophy and reflect current priorities.

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

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 809 / *New Trust Approach Demonstration*

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 2020	FY 2021	FY 2022
Title: New Trust Approach Demonstration	13.381	-	-
Accomplishments/Planned Programs Subtotals	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 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 809 / *New Trust Approach Demonstration*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 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	72.479	13.381	Mar 2020	-		-		-		-	-	-	-
		Subtotal	72.479	13.381		-		-		-		-	-	-	N/A

Remarks

NA

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	72.479	13.381		0.000		-		-		-	-	-	N/A

Remarks

N/A

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 809 / *New Trust Approach Demonstration*

	FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025				FY 2026			
	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 Demonstration																												
Field programmable gate array (FPGA) integrated assurance analysis/logical and physical verification tool demonstration	■	■	■	■																								
Automated design and verification and demonstration	■	■	■	■																								
Validation of custom integrated circuits and demonstration	■	■	■	■																								
Cloud hardware emulation/virtual instrumentation	■	■	■	■																								
Third party intellectual property (IP) and electronic design automation (EDA) tool repository development and demonstration	■	■	■	■																								
Technical capability improvement development and demonstration	■	■	■	■																								
Microelectronics assurance and supply chain demonstrations	■	■	■	■																								
U.S. Government and industry engagement for demonstration 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 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 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 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0605294D8Z / *Trusted and Assured Microelectronics*	Project (Number/Name) 822 / *Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) Enhancement and Demonstration*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
822: *Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) Enhancement and Demonstration*	79.654	155.468	0.000	0.000	-	0.000	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In FY 2021, Project Code (Pcode) 822 funds transferred from this Pcode to new Pcodes to correctly align Program Element (PE) funding in support of the Quantifiable Assurance 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.

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

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 822 / *Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) Enhancement and Demonstration*

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 2020	FY 2021	FY 2022
Title: Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) ***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.	155.468	-	-
Accomplishments/Planned Programs Subtotals	155.468	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 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 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 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	155.468	Mar 2020	-		-		-		-	-	-	-
		Subtotal	79.654	155.468		-		-		-		-	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	79.654	155.468		0.000		-		-		-	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 822 / *Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) Enhancement and Demonstration*

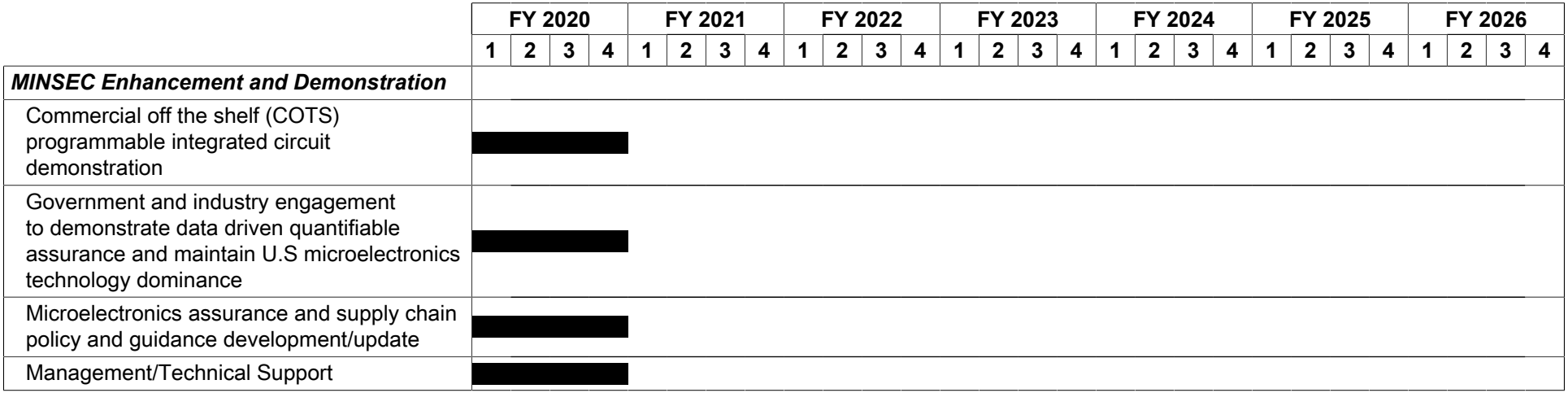


Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 822 / *Microelectronics Innovation for National 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 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0605294D8Z / *Trusted and Assured Microelectronics*	Project (Number/Name) 902 / *Access to State-of-the-Art (SOTA) Microelectronics - Demonstration*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
902: *Access to State-of-the-Art (SOTA) Microelectronics - Demonstration*	0.000	0.000	54.045	51.298	-	51.298	-	-	-	-	-	-
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 2020	FY 2021	FY 2022
Title: Design	-	16.000	0.000

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:

Planned activities are as follows:

• Demonstrate vetted IP repository, which will be available for DoD use of assured tools distributed via cloud services.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 902 / *Access to State-of-the-Art (SOTA) Microelectronics - Demonstration*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
• 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. • Demonstrate enhanced secure design and cloud capability with new tools and techniques. • Continue to build-out secured design environments and persistent technical expertise. ***FY 2022 Plans:*** These efforts are being merged into a combined program for both secure design and quantifiable assurance activities beginning with FY 2022. See “Secure Design and Quantifiable Assurance Demonstration” program below. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** These efforts are being merged into a combined program for both secure design and quantifiable assurance activities beginning with FY 2022. See “Secure Design and Quantifiable Assurance Demonstration” program below.			
Title: Foundry ***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. Demonstrate hardware through dedicated and multi-project wafer runs at multiple foundries. 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. ***FY 2021 Plans:*** Planned activities are as follows: • Demonstrate assured access to multiple SOTA domestic fabrication sources. • Continued build-out of secured design environments and persistent expertise. ***FY 2022 Plans:*** Planned activities are as follows: • Continued build-out of secured design environments and persistent expertise. • Conduct additional domestic SOTA fabrication demonstrations. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Changes reflect minor budget fluctuations.	-	3.834	4.000
Title: Secure Design and Quantifiable Assurance Demonstration	-	34.211	47.298

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 902 / *Access to State-of-the-Art (SOTA) Microelectronics - Demonstration*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022

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.

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) 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.

FY 2021 Plans:
Planned activities are as follows:
• 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.
• Demonstrate scalable classified system for a design and verification ecosystem.
• Establishment and demonstration of commercial field programmable gate array (FPGA) screening capability.
• Continue to establish, demonstrate, and evaluate new quantifiable assurance technologies for FPGA devices.
• Align stakeholders with common concerns to demonstrate assurance enabled SOTA fabrication technologies.

FY 2022 Plans:
Planned activities are as follows:
• Enhance repositories with commercial and DoD relevant design IP for multi-foundry access
• Continue to demonstrate enhanced secure design and cloud capability with new tools and techniques.
• Continue to build-out secured design environments and persistent technical expertise and
• Enable enterprise licensing to tools and IP for rapid and scaled access to leading end technology.
• 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.
• 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.
• Deploy integrated circuit deep inspection capability and conduct integrated circuit personalization demonstration.
• Conduct additional foundry quantifiably assured fabrication demonstrations.

FY 2021 to FY 2022 Increase/Decrease Statement:

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 902 / *Access to State-of-the-Art (SOTA) Microelectronics - Demonstration*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Changes reflect minor budget fluctuations.			
Accomplishments/Planned Programs Subtotals	-	54.045	51.298

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 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0605294D8Z / *Trusted and Assured Microelectronics*	Project (Number/Name) 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 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 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	51.298	Mar 2022	-		51.298	Continuing	Continuing	-
		Subtotal	-	-		54.045		51.298		-		51.298	Continuing	Continuing	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		54.045		51.298		-		51.298	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 902 / *Access to State-of-the-Art (SOTA) Microelectronics - Demonstration*

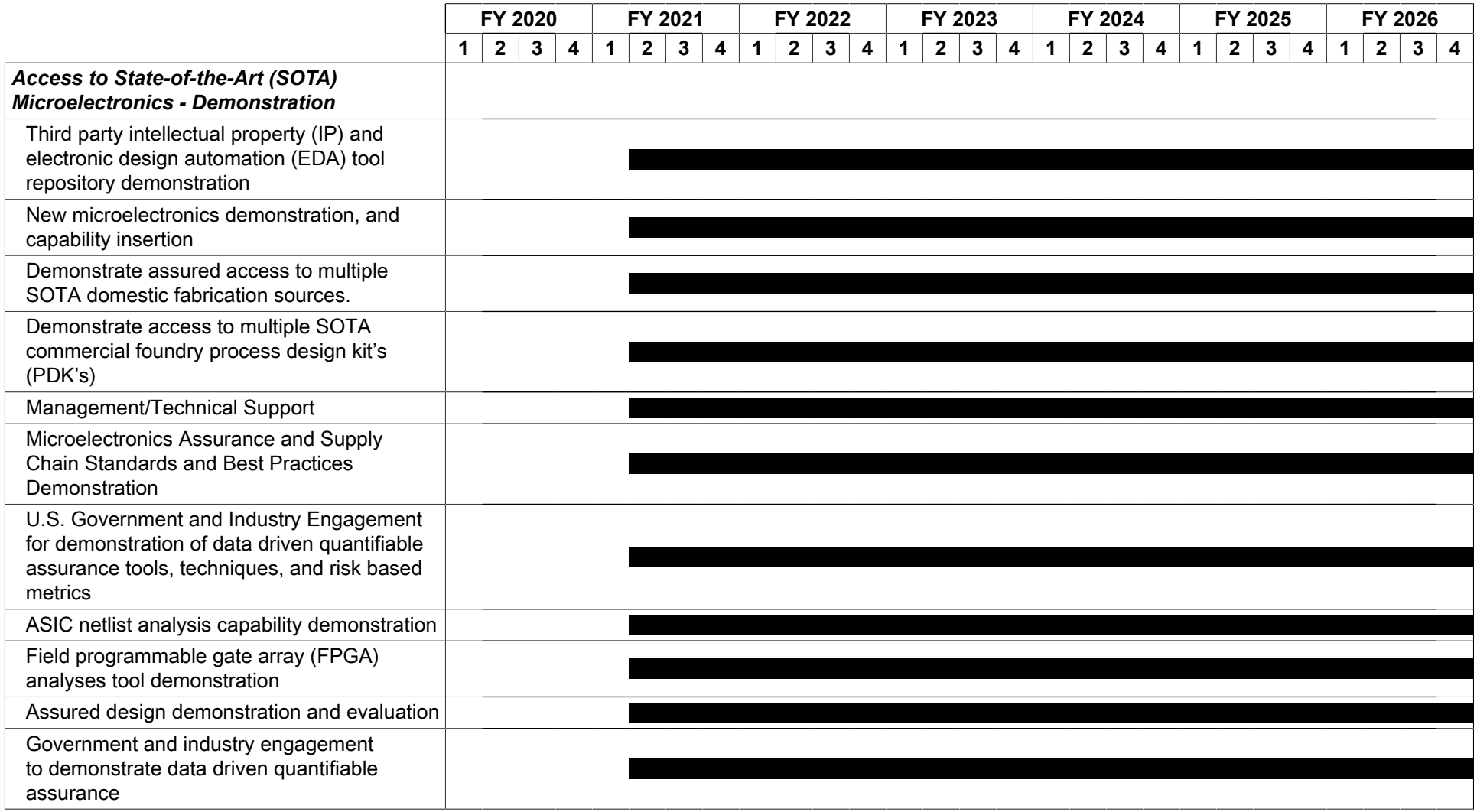


Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 902 / *Access to State-of-the-Art (SOTA) Microelectronics - 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	2026
New microelectronics demonstration, and capability insertion	2	2021	4	2026
Demonstrate assured access to multiple SOTA domestic fabrication sources.	2	2021	4	2026
Demonstrate access to multiple SOTA commercial foundry process design kit's (PDK's)	2	2021	4	2026
Management/Technical Support	2	2021	4	2026
Microelectronics Assurance and Supply Chain Standards and Best Practices Demonstration	2	2021	4	2026
U.S. Government and Industry Engagement for demonstration of data driven quantifiable assurance tools, techniques, and risk based metrics	2	2021	4	2026
ASIC netlist analysis capability demonstration	2	2021	4	2026
Field programmable gate array (FPGA) analyses tool demonstration	2	2021	4	2026
Assured design demonstration and evaluation	2	2021	4	2026
Government and industry engagement to demonstrate data driven quantifiable assurance	2	2021	4	2026

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0605294D8Z / *Trusted and Assured Microelectronics*	Project (Number/Name) 903 / *Access to Advanced Packaging and Testing - Demonstration*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
903: *Access to Advanced Packaging and Testing - Demonstration*	0.000	0.000	39.040	41.797	-	41.797	-	-	-	-	-	-
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 2020	FY 2021	FY 2022
Title: Access to Advanced Packaging and Testing - Demonstration	-	39.040	41.797
Description: 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). ***FY 2021 Plans:*** Planned activities are as follows: • Demonstrate enhanced secure design and secure packaging with new tools and techniques. • Continue demonstration of heterogeneous integration for secure packaging and test. ***FY 2022 Plans:*** Planned activities are as follows: • Continue to demonstrate enhanced secure design and secure packaging with new tools and techniques. • Continue demonstration of heterogeneous integration for secure packaging and test. • Demonstrate prototype hardware and additional program-driven designs of increasing complexity and capability/performance. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Changes reflect minor budget fluctuations			
Accomplishments/Planned Programs Subtotals	-	39.040	41.797

C. Other Program Funding Summary ($ in Millions)

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 903 / *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 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 903 / *Access to Advanced Packaging and Testing - Demonstration*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 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	41.797	Mar 2022	-		41.797	Continuing	Continuing	-
		Subtotal	-	-		39.040		41.797		-		41.797	Continuing	Continuing	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		39.040		41.797		-		41.797	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 903 / *Access to Advanced Packaging and Testing - Demonstration*

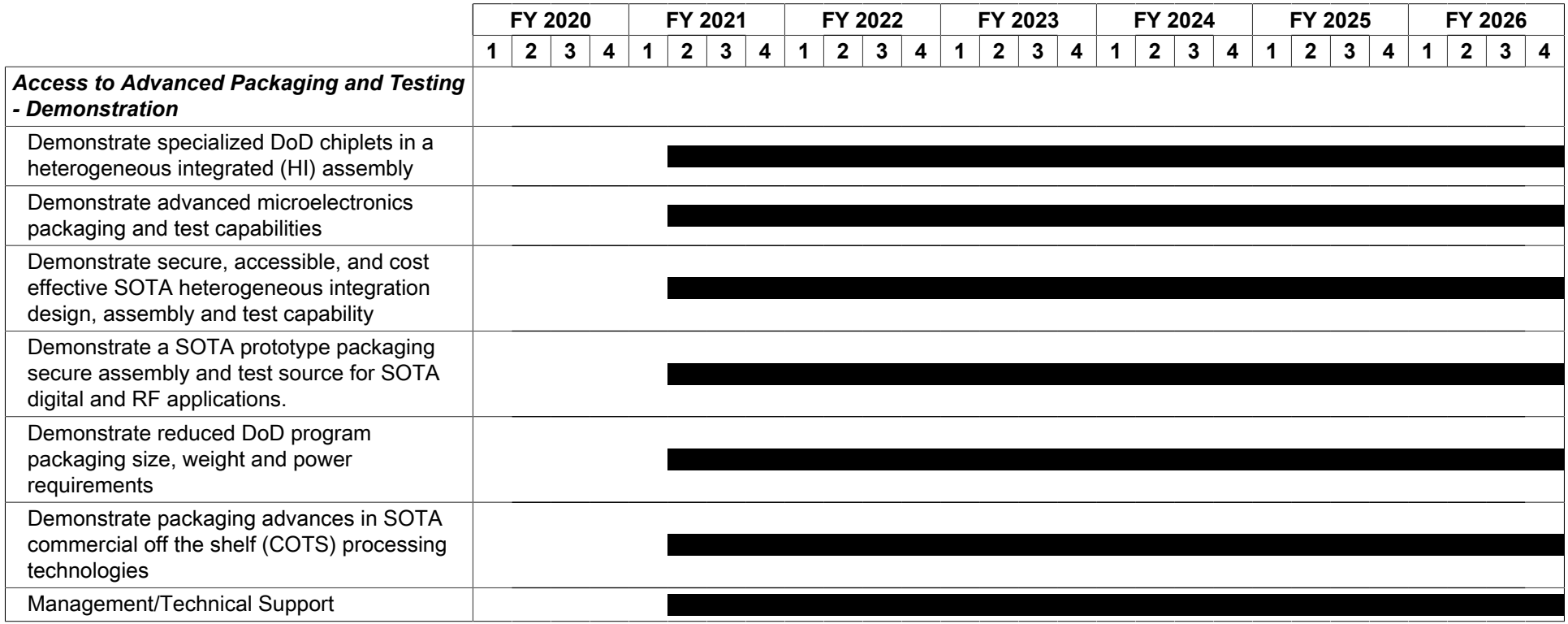


Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 903 / *Access to Advanced Packaging and Testing - 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	2026
Demonstrate advanced microelectronics packaging and test capabilities	2	2021	4	2026
Demonstrate secure, accessible, and cost effective SOTA heterogeneous integration design, assembly and test capability	2	2021	4	2026
Demonstrate a SOTA prototype packaging secure assembly and test source for SOTA digital and RF applications.	2	2021	4	2026
Demonstrate reduced DoD program packaging size, weight and power requirements	2	2021	4	2026
Demonstrate packaging advances in SOTA commercial off the shelf (COTS) processing technologies	2	2021	4	2026
Management/Technical Support	2	2021	4	2026

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0605294D8Z / *Trusted and Assured Microelectronics*	Project (Number/Name) 905 / *Address DoD Unique Needs Especially Radiation Hardening - Demonstration*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
905: *Address DoD Unique Needs Especially Radiation Hardening - Demonstration*	0.000	0.000	14.428	20.800	-	20.800	-	-	-	-	-	-
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 2020	FY 2021	FY 2022
Title: Address DoD Unique Needs Especially Radiation Hardening - Demonstration	-	14.428	20.800
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). 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.			
FY 2021 Plans: Planned activities are as follows:			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 905 / *Address DoD Unique Needs Especially Radiation Hardening - Demonstration*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
• Demonstrate enhanced DoD Lab test and evaluation infrastructure required for verification and validation of radiation hardened microelectronics, technology characterization, and device modeling and simulation. • Demonstrate advanced radiation hardened System on Chip (SOC) and memory technology in support of DoD program modernization efforts with radiation hardened requirements. • Demonstrate SOTP and SOTA technologies utilizing Radiation Hardened By Process (RHBP) and Radiation Hardened By Design (RHBD) activities in support of DoD modernization programs with radiation hardened requirements. • 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. • Procure and evaluate advanced Gallium Nitride (GaN) substrates to establish an assured source. • 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. • Major milestones will be GaN wafer deliveries and assured GaN RF circuits via Secure Design Challenge. • Continue to enhance the foundations of assurance for RF and optoelectronics (OE) applications by demonstrating new capabilities such as additive manufacturing. ***FY 2022 Plans:*** Planned activities are as follows: • Continue to demonstrate SOTP and SOTA technologies utilizing RHBP and RHBD activities in support of DoD modernization programs with radiation hardened requirements. • Transition developed RH technologies into space and strategic programs. • Conduct light detection and ranging (LiDAR) technology demonstration in conjunction with the Defense Advanced Research Projects Agency. • Operationally demonstrate advanced RFOE module prototypes and IP for programs of record. • Demonstrate and transition advanced RFOE modules to DoD programs, while enhancing US leadership in foundational Defense Industrial Base markets. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Funding increased to properly align funding in support of the Quantifiable Assurance philosophy and reflect current priorities.			
Accomplishments/Planned Programs Subtotals	-	14.428	20.800

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 905 / *Address DoD Unique Needs Especially Radiation Hardening - Demonstration*

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0605294D8Z / *Trusted and Assured Microelectronics*	Project (Number/Name) 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 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 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	-	-		14.428	Mar 2021	20.800	Mar 2022	-		20.800	Continuing	Continuing	-
		Subtotal	-	-		14.428		20.800		-		20.800	Continuing	Continuing	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		14.428		20.800		-		20.800	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 905 / *Address DoD Unique Needs Especially Radiation Hardening - Demonstration*

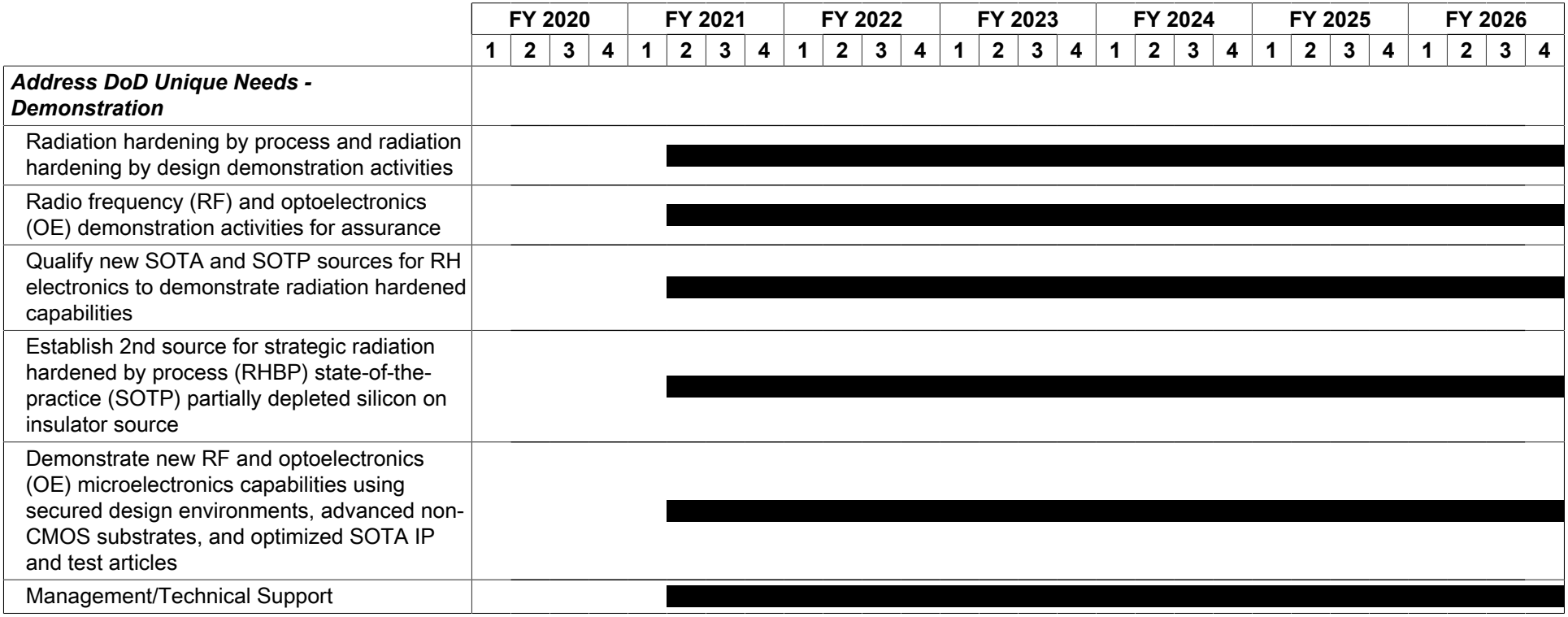


Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605294D8Z / *Trusted and Assured Microelectronics*	**Project (Number/Name)** 905 / *Address DoD Unique Needs Especially Radiation 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	2026
Radio frequency (RF) and optoelectronics (OE) demonstration activities for assurance	2	2021	4	2026
Qualify new SOTA and SOTP sources for RH electronics to demonstrate radiation hardened capabilities	2	2021	4	2026
Establish 2nd source for strategic radiation hardened by process (RHBP) state-of-the-practice (SOTP) partially depleted silicon on insulator source	2	2021	4	2026
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	2026
Management/Technical Support	2	2021	4	2026

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 0605772D8Z / *Nuclear Command, Control and Communications (NC3)*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	0.000	0.000	3.683	3.991	-	3.991	-	-	-	-	Continuing	Continuing
815: *Nuclear Command, Control and Communications (NC3)*	0.000	0.000	3.683	3.991	-	3.991	-	-	-	-	Continuing	Continuing

A. Mission Description and Budget Item Justification

This program supports the Under Secretary of Defense for Acquisition and Sustainment roles as 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) assess NC3 modernization programs and their integration, synchronization, and contribution to the NC3 enterprise, 2) monitor the readiness of operational NC3 systems, 3) identify performance gaps and make recommendations on technology upgrades and prototyping to enable the future capabilities to outpace the threat, and 4) support data-driven portfolio management by developing the necessary tools and processes to assess and manage integrated programmatic and technical risks. 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, U.S. Strategic Command (USSTRATCOM) as NC3 Enterprise Lead; 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 assessments, 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 and technical risk assessments;
2) supporting 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, analyses, and policy updates);
3) assessing DoD Component plans, programs, and budgets for adequacy and execution (including courses of action development and recommendations);
4) identifying, prototyping, evaluating, and recommending new technology for inclusion in the NC3 system; and
5) Developing NC3 corrective action and risk mitigation plans to support the NC3 CPM investment recommendations to senior DoD leadership.

.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 0605772D8Z *I Nuclear Command, Control and Communications (NC3)*

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	3.685	4.068	-	4.068
Current President's Budget	0.000	3.683	3.991	-	3.991
Total Adjustments	0.000	-0.002	-0.077	-	-0.077
• Congressional General Reductions	-	-0.002			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Program Adjustments	-	-	-0.077	-	-0.077

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0605772D8Z / *Nuclear Command, Control and Communications (NC3)*	Project (Number/Name) 815 / *Nuclear Command, Control and Communications (NC3)*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
815: *Nuclear Command, Control and Communications (NC3)*	0.000	0.000	3.683	3.991	-	3.991	-	-	-	-	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 2020	FY 2021	FY 2022
Title: Nuclear Command, Control and Communications (NC3)	-	3.683	3.991
FY 2021 Plans: Support the NC3 governance process by providing analysis and recommendations to the NC3 CPM for presentation to senior leadership bodies (NC3 Enterprise Review, Deputy's Management Action Group, SECDEF Weekly Priorities Review, etc.). Support programmatic (cost, schedule, and performance) analysis on the NC3 portfolio of programs, systems, and facilities. Work collaboratively with the NC3 Enterprise Center (NEC), Services, and DoD Agencies to develop strategies to correct deficiencies and speed modernization. Evaluate, make recommendations, and support NC3 CPM interaction with Congress.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605772D8Z / *Nuclear Command, Control and Communications (NC3)*	**Project (Number/Name)** 815 / *Nuclear Command, Control and Communications (NC3)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
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. Review Commander, U.S. Strategic Command's NC3 Capability Planning Guidance and support the NC3 CPM in tracking Component compliance. 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. ***FY 2022 Plans:*** Support the NC3 governance process by providing analysis and recommendations to the NC3 CPM for presentation to senior leadership bodies (NC3 Enterprise Review, Deputy's Management Action Group, SECDEF Weekly Priorities Review, etc.). Support programmatic (cost, schedule, and performance) analysis on the NC3 portfolio of programs, systems, and facilities. Work collaboratively with the NC3 Enterprise Center (NEC), Services, and DoD Agencies to develop strategies to correct deficiencies and speed modernization. Evaluate, make recommendations, and support NC3 CPM interaction with Congress. 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. Review Commander, U.S. Strategic Command's NC3 Capability Planning Guidance and support the NC3 CPM in tracking Component compliance. 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. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Increase from FY 2021 to FY 2022 is to support the development and operation of analytical tools to evaluate authoritative data (cost, schedule, performance, risk) on NC3 Portfolio programs.			
Accomplishments/Planned Programs Subtotals	-	3.683	3.991

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605772D8Z / *Nuclear Command, Control and Communications (NC3)*	**Project (Number/Name)** 815 / *Nuclear Command, Control and Communications (NC3)*

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 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605772D8Z / *Nuclear Command, Control and Communications (NC3)*	**Project (Number/Name)** 815 / *Nuclear Command, Control and Communications (NC3)*

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 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	-	-		3.683	Jan 2021	3.991		-		3.991	Continuing	Continuing	-
		Subtotal	-	-		3.683		3.991		-		3.991	Continuing	Continuing	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		3.683		3.991		-		3.991	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605772D8Z / *Nuclear Command, Control and Communications (NC3)*	**Project (Number/Name)** 815 / *Nuclear Command, Control and Communications (NC3)*

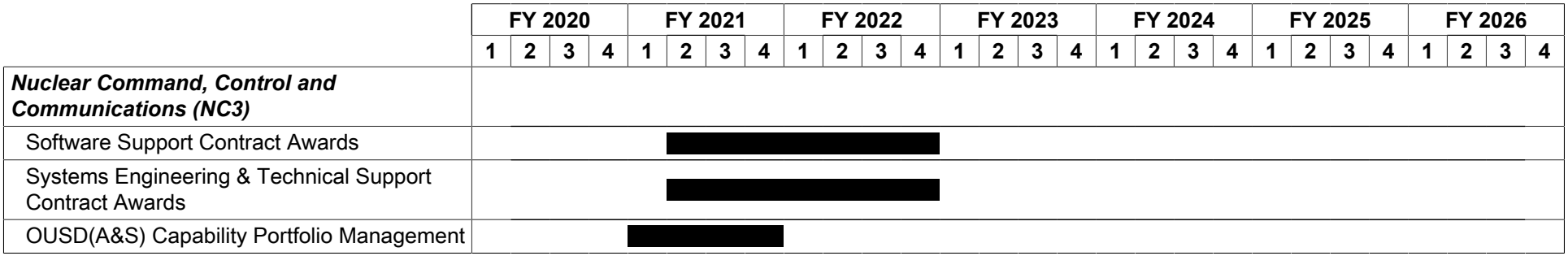


Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0605772D8Z / *Nuclear Command, Control and Communications (NC3)*	**Project (Number/Name)** 815 / *Nuclear Command, Control and 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

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 0305304D8Z / *DoD Enterprise Energy Information Management (EEIM)*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	13.918	4.537	3.273	2.227	-	2.227	-	-	-	-	-	-
305: *Real Property Accountability*	12.027	4.188	1.952	1.878	-	1.878	-	-	-	-	-	-
306: *DoD Siting Clearinghouse*	1.686	0.349	0.349	0.349	-	0.349	-	-	-	-	-	-
307: *Cyber Security*	0.205	0.000	0.972	0.000	-	0.000	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

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. DoD Enterprise Energy Information Management 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 the Assistant Secretary of Defense (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 and Integration Support (DAIS) platform coupled with an independent verification and 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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	4.373	3.275	2.601	-	2.601
Current President's Budget	4.537	3.273	2.227	-	2.227
Total Adjustments	0.164	-0.002	-0.374	-	-0.374
• Congressional General Reductions	-	-0.002			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	0.164	-			
• SBIR/STTR Transfer	-	-			
• Program Adjustments	-	-	-0.374	-	-0.374

Change Summary Explanation

The FY 2022 funding request was reduced by $1.234 million to account for the availability of prior year execution balances.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0305304D8Z / *DoD Enterprise Energy Information Management (EEIM)*	Project (Number/Name) 305 / *Real Property Accountability*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
305: *Real Property Accountability*	12.027	4.188	1.952	1.878	-	1.878	-	-	-	-	-	-
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 2020	FY 2021	FY 2022
Title: Real Property Accountability	4.188	1.952	1.878
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 and 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 2021 Plans: 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 and Integration Support (DAIS) platform and Web Services Description Language (WSDL) implementation to improve data quality supporting multiple analyses.			
FY 2022 Plans: 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 and Integration Support (DAIS) platform and Web Services Description Language (WSDL) implementation to improve data quality supporting multiple analyses.			
FY 2021 to FY 2022 Increase/Decrease Statement:			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0305304D8Z / *DoD Enterprise Energy Information Management (EEIM)*	**Project (Number/Name)** 305 / *Real Property Accountability*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
The FY 2022 funding request was reduced by $0.262 million to account for the availability of prior year execution balances.			
Accomplishments/Planned Programs Subtotals	4.188	1.952	1.878

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 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0305304D8Z / *DoD Enterprise Energy Information Management (EEIM)*	Project (Number/Name) 305 / *Real Property Accountability*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
EI&E Data Analytics & Integration Platform	C/FFP	FTC : Herndon VA	1.588	1.951	Mar 2020	0.750	Mar 2021	0.703	Mar 2022	-		0.703	Continuing	Continuing	-
		Subtotal	1.588	1.951		0.750		0.703		-		0.703	Continuing	Continuing	N/A

Remarks

NA

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
BSI Support Contract Extension	C/FFP	ANSER : Mark Center	8.910	-		-		1.175	Apr 2022	-		1.175	Continuing	Continuing	-
Defense Installation Spatial Data Infrastructure (DISDI) IGI&S Portal	MIPR	USACE : CRREL	0.948	0.350	May 2020	0.202	May 2021	-		-		-	Continuing	Continuing	-
BSI Support Contract Re-compete (7 Month Base)	C/FFP	TBD : Mark Center	0.581	1.887	Apr 2020	1.000	Apr 2021	-		-		-	Continuing	Continuing	-
		Subtotal	10.439	2.237		1.202		1.175		-		1.175	Continuing	Continuing	N/A

Remarks

NA

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	12.027	4.188		1.952		1.878		-		1.878	Continuing	Continuing	N/A

Remarks

NA

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0305304D8Z / *DoD Enterprise Energy Information Management (EEIM)*	**Project (Number/Name)** 305 / *Real Property Accountability*

ID	Task Name	Start	Finish
1	EI&E DBS PfM Reviews	10/01/18	continuous
2	Develop FY-20 BEA Artifacts	01/01/19	01/30/21
3	RPIM Updates	11/01/20	11/30/22
4	EI&E BPR	10/01/20	03/20/22
5	IV&V	10/01/18	continuous
6	EI&E Processes Auditability	10/01/20	09/30/21
7	EI&E Data Analytics & Integrat	10/01/20	09/30/22
8	DISDI IGI&S Portal	10/01/20	09/30/22

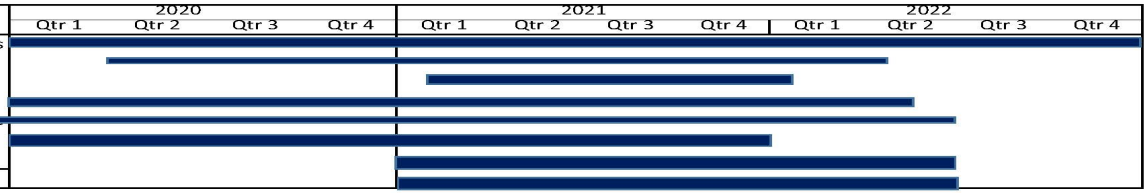


Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0305304D8Z / *DoD Enterprise Energy Information Management (EEIM)*	**Project (Number/Name)** 305 / *Real Property Accountability*

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 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0305304D8Z / *DoD Enterprise Energy Information Management (EEIM)*	Project (Number/Name) 306 / *DoD Siting Clearinghouse*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
306: *DoD Siting Clearinghouse*	1.686	0.349	0.349	0.349	-	0.349	-	-	-	-	-	-
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 research and development 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 2020	FY 2021	FY 2022
Title: DoD Siting Clearinghouse	0.349	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 research and development is necessary to study potential technical improvements to radar. ***FY 2021 Plans:*** Continue to support radar studies as planned through the Wind Turbine Interference Mitigation Forum. ***FY 2022 Plans:*** Continue to support radar studies as planned through the Wind Turbine Interference Mitigation Forum.			
Accomplishments/Planned Programs Subtotals	0.349	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 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0305304D8Z / *DoD Enterprise Energy Information Management (EEIM)*	Project (Number/Name) 306 / *DoD Siting Clearinghouse*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 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	0.349	Jan 2020	0.349	Jan 2021	0.349	Jan 2022	-		0.349	Continuing	Continuing	-
		Subtotal	1.686	0.349		0.349		0.349		-		0.349	Continuing	Continuing	N/A

Remarks

NA

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	1.686	0.349		0.349		0.349		-		0.349	Continuing	Continuing	N/A

Remarks

NA

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0305304D8Z / *DoD Enterprise Energy Information Management (EEIM)*	**Project (Number/Name)** 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

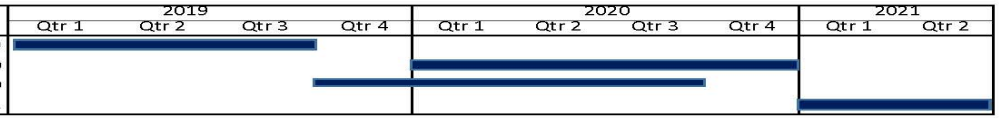


Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0305304D8Z / *DoD Enterprise Energy In formation Management (EEIM)*	**Project (Number/Name)** 306 / *DoD Siting Clearinghouse*

ID	Task Name	Start	Finish
2	Develop FY-21 Program	10/01/19	06/30/20
3	FY-21 Study Eval	01/01/21	09/31/21
4	Develop FY-22 Program	10/01/20	06/30/21
3	FY-22 Study Eval	01/01/22	03/31/22

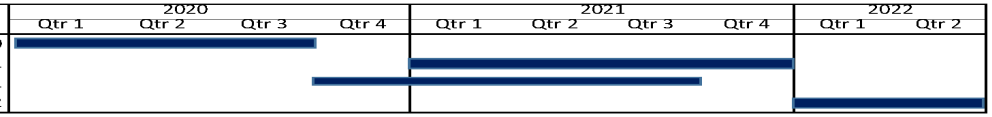


Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0305304D8Z / *DoD Enterprise Energy Information Management (EEIM)*	**Project (Number/Name)** 306 / *DoD Siting Clearinghouse*

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 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0305304D8Z / *DoD Enterprise Energy Information Management (EEIM)*	Project (Number/Name) 307 / *Cyber Security*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
307: *Cyber Security*	0.205	0.000	0.972	0.000	-	0.000	-	-	-	-	-	-
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 and 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 2020	FY 2021	FY 2022
Title: Real Property	0.000	0.972	0.000

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.)
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.
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.

FY 2021 Plans:
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 Department of Energy (DOE) this year.

FY 2022 Plans:
Support Real Property Data Analysis, Installation Geospatial Information and Services deficits and Clearing House program requirements not covered by shortages in existing elements. Cyber requirements no longer funded by this element starting with FY 2021.

FY 2021 to FY 2022 Increase/Decrease Statement:

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0305304D8Z / *DoD Enterprise Energy Information Management (EEIM)*	**Project (Number/Name)** 307 / *Cyber Security*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
The FY 2022 funding request was reduced by $0.972 million to account for the availability of prior year execution balances.			
Accomplishments/Planned Programs Subtotals	0.000	0.972	0.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0305304D8Z / *DoD Enterprise Energy Information Management (EEIM)*	**Project (Number/Name)** 307 / *Cyber Security*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
DISDI Portal	C/FFP	USACE Contracted Vendor : USACE	-	-		0.500	Apr 2021	0.000	Mar 2022	-		0.000	Continuing	Continuing	-
		Subtotal	-	-		0.500		0.000		-		0.000	Continuing	Continuing	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 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	0.000	May 2020	-		-		-		-	Continuing	Continuing	-
Continue to support radar studies as planned through the Wind Turbine Interference Mitigation Forum.	FFRDC	TBD : TBD	-	-		0.472	May 2021	0.000	May 2022	-		0.000	Continuing	Continuing	-
		Subtotal	0.205	0.000		0.472		0.000		-		0.000	Continuing	Continuing	N/A

Remarks

NA

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.205	0.000		0.972		0.000		-		0.000	Continuing	Continuing	N/A

Remarks

NA

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0305304D8Z / *DoD Enterprise Energy In formation Management (EEIM)*	**Project (Number/Name)** 307 / *Cyber Security*

ID	Task Name	Start	Finish
2	Develop FY-21 Program	10/01/19	06/30/20
3	FY-21 Study Eval	01/01/21	09/31/21
4	Develop FY-22 Program	10/01/20	06/30/21
3	FY-22 Study Eval	01/01/22	03/31/22
3	Develop FY-20 Program	03/01/20	02/28/21
4	FY20 PRMA Evaluations	07/01/20	09/30/21
	DISDI IGI&S Portal	10/01/20	09/30/22

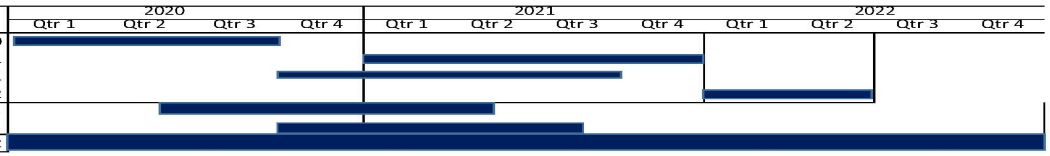


Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0305304D8Z / *DoD Enterprise Energy Information Management (EEIM)*	**Project (Number/Name)** 307 / *Cyber Security*

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-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 0305310D8Z / *CWMD Systems: System Development & Demonstration*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	24.599	11.759	20.572	20.246	-	20.246	-	-	-	-	-	-
813: *CWMD Systems: System Development & Demonstration*	24.599	11.759	20.572	20.246	-	20.246	-	-	-	-	-	-

Note

N/A

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 exploit and defeat 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 validated 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. Resulting fielded capabilities illuminate WMD networks; exploit vulnerabilities in networks, programs, facilities, and weapons systems; and disable or defeat WMD and their delivery systems.

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 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 0305310D8Z *I CWMD Systems: System Development & Demonstration*

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	12.854	20.585	20.859	-	20.859
Current President's Budget	11.759	20.572	20.246	-	20.246
Total Adjustments	-1.095	-0.013	-0.613	-	-0.613
• Congressional General Reductions	-	-0.013			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Program Adjustments	-1.095	-	-0.613	-	-0.613

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0305310D8Z / *CWMD Systems: System Development & Demonstration*	Project (Number/Name) 813 / *CWMD Systems: System Development & Demonstration*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
813: *CWMD Systems: System Development & Demonstration*	24.599	11.759	20.572	20.246	-	20.246	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

N/A

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 exploit and defeat 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 validated 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. Resulting fielded capabilities illuminate WMD networks; exploit vulnerabilities in networks, programs, facilities, and weapons systems; and disable or defeat WMD and their delivery systems.

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.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: P*813 / CWMD Systems: System Development & Demonstration	11.759	20.572	20.246

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0305310D8Z / *CWMD Systems: System Development & Demonstration*	**Project (Number/Name)** 813 / *CWMD Systems: System Development & Demonstration*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
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. Resulting fielded capabilities illuminate WMD networks; exploit vulnerabilities in networks, programs, facilities, and weapons systems; and disable or defeat WMD and their delivery systems. ***FY 2021 Plans:*** • 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. • Transition CWMD capabilities developed under a number of classified projects to US Special Operations Command. • Transition capabilities that enhance Air Force Technical Applications Center (AFTAC) ability to support nuclear treaty monitoring and nuclear event detection. • Develop and deliver CWMD capabilities to Military Services, Defense Agencies, and other partners. ***FY 2022 Plans:*** • Develop, transition, and field operational CWMD capabilities to US Special Operations Command. • Partner with the Military Services to mature and transition advanced prototypes to fielded CWMD capabilities. • Develop and deliver capabilities that enhance Air Force Technical Applications Center (AFTAC) ability to support nuclear treaty monitoring and nuclear event detection. • Continue maturation of prototypes, systems, and components for test and evaluation by end-users and transition to fieldable CWMD capabilities under other classified projects. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The decrease in FY 2022 is representative of program adjustments to align with National Defense Strategy priorities.			
Accomplishments/Planned Programs Subtotals	11.759	20.572	20.246

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0305310D8Z / *CWMD Systems: System Development & Demonstration*	**Project (Number/Name)** 813 / *CWMD Systems: System Development & Demonstration*

D. Acquisition Strategy

The Office of the Deputy Assistant Secretary of Defense for Threat Reduction and Arms Control (ODASD(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 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0305310D8Z / *CWMD Systems: System Development & Demonstration*	**Project (Number/Name)** 813 / *CWMD Systems: System Development & Demonstration*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Engineering & manufacturing development of information systems & components	C/T&M	TBD : TBD	12.300	5.879	Jan 2020	10.287	Jan 2021	-		-		-	-	-	-
Systems development & demonstration, and initial operational test & evaluation	C/T&M	TBD : TBD	9.839	4.704	Jan 2020	8.228	Jan 2021	-		-		-	-	-	-
Program management support	C/T&M	TBD : TBD	2.460	1.176	Jan 2020	2.057	Jan 2021	-		-		-	-	-	-
Develop and transition fieldable CWMD capabilities to US Special Operations Command and its components	MIPR	USSOCOM : TBD	-	-		-		9.209	Jan 2022	-		9.209	-	-	-
Partner with the Services to develop advanced prototypes and fielded CWMD capabilities.	MIPR	TBD : TBD	-	-		-		3.276	Jan 2022	-		3.276	-	-	-
Deliver toolkits and applications that enhance Air Force Technical Applications Center (AFTAC) capabilities to support nuclear treaty monitoring and nuclear event detection.	MIPR	AFTAC : TBD	-	-		-		3.464	Jan 2022	-		3.464	-	-	-
Continue maturation of prototypes, systems, and components for test and evaluation by end-users and transition to fieldable capabilities of other classified projects.	MIPR	TBD : TBD	-	-		-		4.297	Jan 2022	-		4.297	-	-	-
		Subtotal	24.599	11.759		20.572		20.246		-		20.246	-	-	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0305310D8Z / *CWMD Systems: System Development & Demonstration*	Project (Number/Name) 813 / *CWMD Systems: System Development & Demonstration*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract

Remarks

N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	24.599	11.759		20.572		20.246		-		20.246	-	-	N/A

Remarks

NA

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0305310D8Z / *CWMD Systems: System Development & Demonstration*	**Project (Number/Name)** 813 / *CWMD Systems: System Development & Demonstration*

CWMD Systems: Operational System Development
BA 5 / PE 0305310D8Z

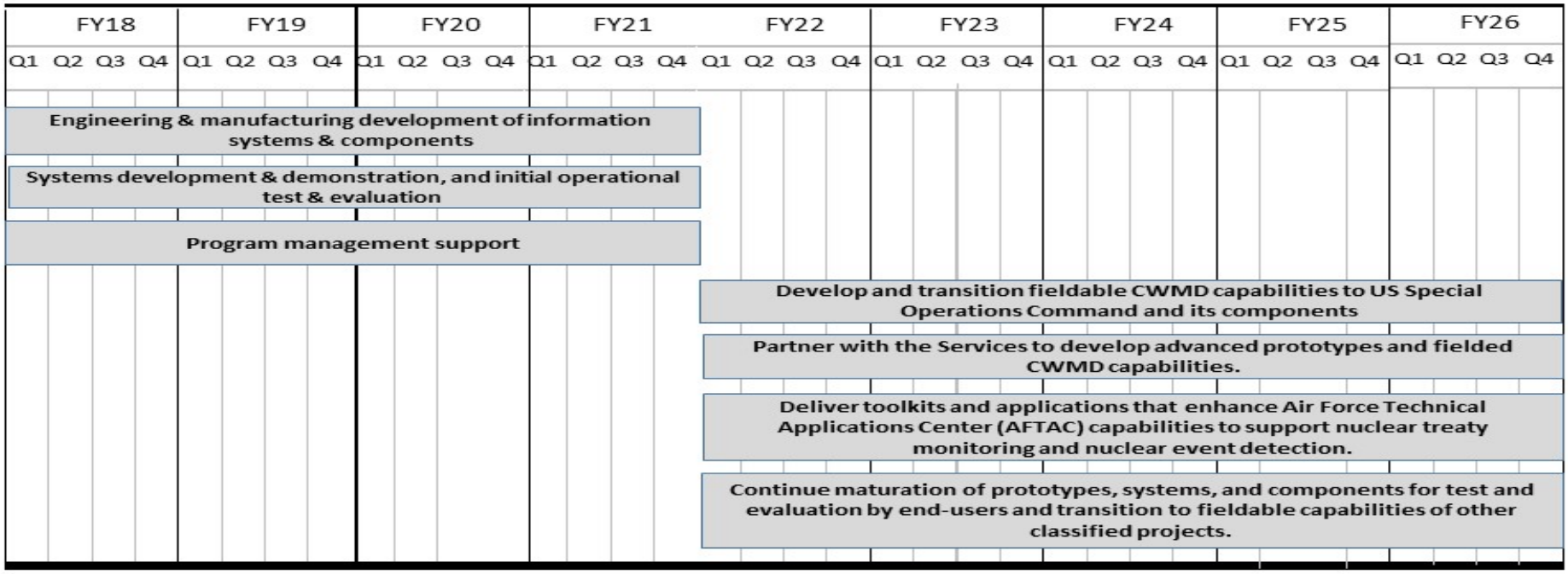


Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 5	**R-1 Program Element (Number/Name)** PE 0305310D8Z / *CWMD Systems: System Development & Demonstration*	**Project (Number/Name)** 813 / *CWMD Systems: System Development & Demonstration*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Develop and transition fieldable CWMD capabilities to US Special Operations Command and its components				
Develop and transition fieldable CWMD capabilities to US Special Operations Command and its components	2	2022	4	2026
Partner with the Services to develop advanced prototypes and fielded CWMD capabilities.				
Partner with the Services to develop advanced prototypes and fielded CWMD capabilities.	2	2022	4	2026
Deliver toolkits and applications that enhance Air Force Technical Applications Center (AFTAC) capabilities to support nuclear treaty monitoring and nuclear event detection.				
Deliver toolkits and applications that enhance Air Force Technical Applications Center (AFTAC) capabilities to support nuclear treaty monitoring and nuclear event detection.	2	2022	4	2026
Continue maturation of prototypes, systems, and components for test and evaluation by end-users and transition to fieldable capabilities of other classified projects.				
Continue maturation of prototypes, systems, and components for test and evaluation by end-users and transition to fieldable capabilities of other classified projects.	2	2022	4	2026
Engineering & manufacturing development of information systems & components				
Engineering & manufacturing development of information systems & components	2	2020	4	2021
Systems development & demonstration, and initial operational test & evaluation				
Systems development & demonstration, and initial operational test & evaluation	2	2020	4	2021
Program management support				
Program management support	2	2020	4	2021

THIS PAGE INTENTIONALLY LEFT BLANK

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 0604774D8Z / *Defense Readiness Reporting System (DRRS)*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	48.161	9.722	9.793	7.508	-	7.508	-	-	-	-	-	-
774: *Defense Readiness Reporting System (DRRS)*	48.161	9.722	9.793	7.508	-	7.508	-	-	-	-	-	-

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.

FY 2019 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 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 0604774D8Z / *Defense Readiness Reporting System (DRRS)*

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	9.724	9.793	9.858	-	9.858
Current President's Budget	9.722	9.793	7.508	-	7.508
Total Adjustments	-0.002	0.000	-2.350	-	-2.350
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Program Adjustment	-0.002	-	-2.350	-	-2.350

Change Summary Explanation

The FY 2022 funding request was reduced by $2.236 million to account for the availability of prior year execution balances.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0604774D8Z / *Defense Readiness Reporting System (DRRS)*	Project (Number/Name) 774 / *Defense Readiness Reporting System (DRRS)*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
774: *Defense Readiness Reporting System (DRRS)*	48.161	9.722	9.793	7.508	-	7.508	-	-	-	-	-	-
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.

FY 2019 NDAA made revisions to Title 10 U.S. Code directing the Department of Defense to take actions which required growth in the DRRS-S program. The legislation identified the program's need to achieve and 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 required to operationalize the Global Force Management - Data Initiative, and reporting at lower organizational levels consistent with how the Department's forces are employed.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: 774 Defense Readiness Reporting System	9.722	9.793	7.508
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 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0604774D8Z / *Defense Readiness Reporting System (DRRS)*	**Project (Number/Name)** 774 / *Defense Readiness Reporting System (DRRS)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
readiness data environment to leverage and extend current readiness information systems. DRRS contains readiness metrics and supporting data for forces and support organizations. ***FY 2021 Plans:*** • Integration into DRRS-S of data sources and the creation of new functionality necessary to support the consolidation of Service readiness reporting systems into DRRS-Strategic. • Optimize program architecture to make use of hosting technology advancements. • Incorporate functionality enhancements required by evolving readiness reporting needs. • GFM DI "next steps" development. • Replacement of vulnerable & legacy software components. ***FY 2022 Plans:*** • Integration into DRRS-S of data sources and the creation of new functionality necessary to support readiness reporting reform efforts. • Continued enhancement of program architecture to make use of hosting technology advancements. • Incorporate functionality enhancements required by evolving readiness reporting needs. • Continued GFM DI integration and functionality development. • Replacement of vulnerable & legacy software components. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The FY 2022 funding request was reduced by $2.236 million to account for the availability of prior year execution balances.			
Accomplishments/Planned Programs Subtotals	9.722	9.793	7.508

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 0604875D8Z / *Joint Systems Architecture Development*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	27.726	8.971	8.492	7.859	-	7.859	-	-	-	-	-	-
875: *Portfolio Systems Acquisition (PSA)*	21.742	7.975	4.408	4.570	-	4.570	-	-	-	-	-	-
220: *Electronic Warfare Executive Committee*	5.984	0.996	4.084	3.289	-	3.289	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

The Joint Systems Architecture Development (JSAD) account directly supports the first priority of the 2018 National Defense Strategy, increasing lethality. All efforts within the Office of the Deputy Assistance Secretary of Defense (DASD) for Platform and Weapon Portfolio Management (PWPM) strive to deliver the warfighter the best equipment and systems, and to do so by performing top down, national security strategy-driven capabilities-based planning and fully leveraging Department and acquisition reform initiatives. 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 entail use of Capability Portfolio Management, as well as application of mission engineering to develop mission threads; 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 uses enterprise-wide approaches which include:(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 (Capability Portfolio Management and Reform Initiatives).

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 0604875D8Z / *Joint Systems Architecture Development*

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	9.593	8.497	8.436	-	8.436
Current President's Budget	8.971	8.492	7.859	-	7.859
Total Adjustments	-0.622	-0.005	-0.577	-	-0.577
• Congressional General Reductions	-	-0.005			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-0.270	-			
• SBIR/STTR Transfer	-0.352	-			
• Program Adjustments	-	-	-0.577	-	-0.577

Change Summary Explanation

The FY 2022 funding request was reduced by $0.418 million to account for the availability of prior year execution balances.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0604875D8Z / *Joint Systems Architecture Development*	Project (Number/Name) 875 / *Portfolio Systems Acquisition (PSA)*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
875: *Portfolio Systems Acquisition (PSA)*	21.742	7.975	4.408	4.570	-	4.570	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Department continues to use enterprise-wide approaches which are met through: (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 Adaptive Acquisition Framework process, enacted in 2019 and 2020 as part of acquisition reform, provides the Defense Acquisition Executive and the Service Acquisition Executives alternative acquisition paths for rapid prototyping and rapid acquisition, in an effort to use the fastest, most affordable, and efficient way to deliver new weapon systems with mature technologies and maintains disciplined systems engineering approaches. 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 Capability Portfolio Management. This program enables collaborative efforts to implement the NDR direction outlined above and achieve portfolio systems acquisition goals and to develop and implement acquisition reform initiatives.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Portfolio Systems Acquisition (PSA)	7.975	4.408	4.570
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			
FY 2021 Plans: FY 2021 Plans: - Continue efforts to further develop Capability Portfolio Management practices, including supporting Mission Engineering principles in an effort to make both practices more widespread in use through the Office of the Secretary of Defense, the Joint Staff, and the services. - Further develop portfolio management of programs falling within the Air, Ground, Maritime and Electromagnetic Warfare mission areas, to include application of mission engineering analysis of kill chains. - Identify portfolio and program synergies, reduce duplication, and identify opportunities for cost savings. - Provide technical expertise in support of warfare area portfolios. - Assess progress of program management initiatives and continue support to a variety of certification and qualification standards activities. - Utilized "reliability by design", capability, capacity, and lethality analyses and support to programs.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0604875D8Z / *Joint Systems Architecture Development*	**Project (Number/Name)** 875 / *Portfolio Systems Acquisition (PSA)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
- 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)). - Continue analytical support for the ground combat vehicle portfolio. - Continue analytical support for the naval warfare portfolio. - Continue analytical support for the munitions process, from requirements generation to demilitarization. - 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. - Respond to Government Accountability Office (GAO) inquiries. - Respond to DOD Inspector General (DODIG) inquiries. - Review Council on Foreign Investment in the United States (CFIUS) cases. - Reshape focus and drive solution-oriented outcomes and decisions in all senior-level leadership meetings for the F-35 program to include Executive Steering Groups (ESGs) and other information and decision forums. - Collaborate and shape outcomes across all Programming and Budget Review (PBR) activities such as Strategic Portfolio Reviews (SPRs), Issue Teams, Competitive Area Studies. - 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). - Lead, participate in, and provide support to the Strategic Portfolio Reviews (SPRs) and assigned issue paper teams. - Provide support to the Deputy's Management Action Group (DMAG) and shape outcomes through analytical efforts. - Provide support to the Secretary’s Weekly Priority Review (SWPR) - Provide support to the 3 Star Programmer's meetings.			
FY 2022 Plans: FY 2022 Plans: - Continue efforts to further develop Capability Portfolio Management practices, including supporting Mission Engineering principles in an effort to make both practices more widespread in use through the Office of the Secretary of Defense, the Joint Staff, and the services. - Further develop portfolio management of programs falling within the Air, Ground, Maritime and Electromagnetic Warfare mission areas, to include application of mission engineering analysis of kill chains. - Continue to identify portfolio and program synergies, reduce duplication, and identify opportunities for cost savings. - Continue to provide technical expertise in support of warfare area portfolios. - Continue to assess progress of program management initiatives and continue support to a variety of certification and qualification standards activities.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0604875D8Z / *Joint Systems Architecture Development*	**Project (Number/Name)** 875 / *Portfolio Systems Acquisition (PSA)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
- Continue to 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)). - Continue analytical support for the ground combat vehicle portfolio. - Continue analytical support for the naval warfare portfolio. - Continue analytical support for the munitions process, from requirements generation to demilitarization. - 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. - Respond to Government Accountability Office (GAO) inquiries. - Respond to DOD Inspector General (DODIG) inquiries. - Review Council on Foreign Investment in the United States (CFIUS) cases. - Continue to reshape focus and drive solution-oriented outcomes and decisions in all senior-level leadership meetings for the F-35 program to include Executive Steering Groups (ESGs) and other information and decision forums. - Continue to collaborate and shape outcomes across all Programming and Budget Review (PBR) activities such as Strategic Portfolio Reviews (SPRs), Issue Teams, Competitive Area Studies. - Continue to 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). - Continue to lead, participate in, and provide support to the Strategic Portfolio Reviews (SPRs) and assigned issue paper teams. - Continue to provide support to the Deputy's Management Action Group (DMAG) and shape outcomes through analytical efforts. - Continue to provide support to the Secretary's Weekly Priority Review (SWPR) - Continue to provide support to the 3 Star Programmer's meetings. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increase due to a 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	7.975	4.408	4.570

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0604875D8Z / *Joint Systems Architecture Development*	**Project (Number/Name)** 875 / *Portfolio Systems Acquisition (PSA)*

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0604875D8Z / *Joint Systems Architecture Development*	Project (Number/Name) 220 / *Electronic Warfare Executive Committee*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
220: *Electronic Warfare Executive Committee*	5.984	0.996	4.084	3.289	-	3.289	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Electromagnetic 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 Electromagnetic Spectrum Operations Cross Functional Team (EMSO CFT) which was established and instituted in FY 2019.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Electronic Warfare Executive Committee	0.996	4.084	3.289
Description: 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 Electromagnetic Warfare (EW) Executive Committee (EXCOMM) and provide support to the Electromagnetic Spectrum Operations Cross Functional Team (EMSO CFT).			
FY 2021 Plans: Continue mission engineering analyses and integration to incorporate soft kill and Electromagnetic Warfare effects and weapon systems in critical mission thread areas in order to meet evolving threats. - 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. - Continue to perform the necessary analytic underpinning to develop and field advanced EW capabilities, including EW manning, training, exercises, modeling and simulation. - Identify opportunities for Cross-Service EW collaboration, including EW research and development, acquisition programs, multi-purpose hardware and software, and other initiatives to increase EW investment efficiencies and promote interoperability.			
FY 2022 Plans: - Continue mission engineering analyses and integration to incorporate soft kill and Electromagnetic Warfare effects and weapon systems in critical mission thread areas in order to meet evolving threats.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0604875D8Z / *Joint Systems Architecture Development*	**Project (Number/Name)** 220 / *Electronic Warfare Executive Committee*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
- Continue to 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. - Continue to perform the necessary analytic underpinning to develop and field advanced EW capabilities, including EW manning, training, exercises, modeling and simulation. - Identify opportunities for Cross-Service EW collaboration, including EW research and development, acquisition programs, multi-purpose hardware and software, and other initiatives to increase EW investment efficiencies and promote interoperability. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The FY 2022 funding request was reduced by $0.418 million to account for the availability of prior year execution balances. Decrease also reflects program adjustments.			
Accomplishments/Planned Programs Subtotals	0.996	4.084	3.289

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 0604940D8Z / *Central Test and Evaluation Investment Program (CTEIP)*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	1,633.538	381.356	423.206	550.140	-	550.140	-	-	-	-	-	-
940: *Central Test and Evaluation Investment Program (CTEIP)*	1,633.538	381.356	423.206	550.140	-	550.140	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

Since its inception in FY 1990, Central Test and Evaluation Investment Program (CTEIP) provides the development of critically needed, high-priority Test and Evaluation (T&E) capabilities for joint/multi-Service requirements. CTEIP projects include Hypersonics, Directed Energy, Cyber Security, Electronic Warfare, Missile Defense, Nuclear Effects, Space, Autonomy and Command/Control and Communications. Other Investments in test infrastructure align with objectives in the Strategic Plan for DoD T&E Resources for high priority test needs and common range Infrastructure. The CTEIP uses a corporate investment approach to combine T&E needs from Service, Defense, and other Government agencies in order to maximize opportunities for joint efforts and avoid unwarranted duplication of test capabilities. CTEIP evaluates and selects for execution, project proposals that align to the NDS and USD(R&E) priorities, 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 whole Department. These investments are needed so that test capabilities keep pace with U.S. and adversary technical advances as well as, with quickly changing threats. The CTEIP includes special studies, analyses, project improvements, quick reaction efforts and strategic planning related to test capabilities and infrastructure. CTEIP investments increase efficiency and reduce the cost of testing on DoD's major ranges and test facilities. 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. CTEIP investments in FY 2022 will modernize Long Range Fires and Nuclear Test & Evaluation infrastructures. Long Range Fires modernization will develop new capabilities to test the effectiveness of new materials and designs for long range ballistic/hypersonic weapon systems. Nuclear Enterprise modernization will revitalize DoD's nuclear effects test and evaluation simulators, M&S and other test capabilities needed to assess existing weapon systems, weapons modernization programs and other mission critical systems that must be tested against these effects. CTEIP investments in FY 2022 will also include increased investments in high-priority hypersonic ground and open-air range test capability, critically needed upgrades to DoD Threat Models and Simulations, High Energy Laser test facilities, Nuclear Effects simulators, and live/virtual unmanned autonomous systems.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 0604940D8Z *I Central Test and Evaluation Investment Program (CTEIP)*

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	390.692	422.451	410.939	-	410.939
Current President's Budget	381.356	423.206	550.140	-	550.140
Total Adjustments	-9.336	0.755	139.201	-	139.201
• Congressional General Reductions	-	-0.295			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	1.050			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-9.336	-			
• SBIR/STTR Transfer	-	-			
• Program Adjustment	-	-	139.201	-	139.201

Change Summary Explanation

FY 2022 increase to invest in modernization of Long Range Fires and Nuclear Test & Evaluation infrastructures.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0604940D8Z / *Central Test and Evaluation Investment Program (CTEIP)*	Project (Number/Name) 940 / *Central Test and Evaluation Investment Program (CTEIP)*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
940: *Central Test and Evaluation Investment Program (CTEIP)*	1,633.538	381.356	423.206	550.140	-	550.140	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Central Test and Evaluation Investment Program (CTEIP) develops critically needed, high-priority Test and Evaluation (T&E) capabilities for joint/multi-Service requirements. CTEIP projects include Hypersonics, Directed Energy, Cyber Security, Electronic Warfare, Missile Defense, Nuclear Effects, Space, Autonomy and Command/Control and Communications. Other Investments in test infrastructure align with objectives in the Strategic Plan for DoD T&E Resources for high priority test needs and common range Infrastructure.

The CTEIP uses a corporate investment approach to combine T&E needs from Service, Defense, and other Government agencies in order to maximize opportunities for joint efforts and avoid unwarranted duplication of test capabilities. CTEIP evaluates and selects for execution, project proposals that align to the NDS and USD(R&E) priorities, 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 provides critically needed T&E investments which align to USD(R&E) priorities and the Strategic Plan for DoD T&E Resources. These investments are needed so that test capabilities keep pace with U.S. and adversary technical advances as well as with quickly changing threats. The CTEIP includes special studies, analyses, project improvements, quick reaction efforts and strategic planning related to test capabilities and infrastructure. CTEIP investments increase efficiency and reduce the cost of testing on DoD's major ranges and test facilities. 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.

CTEIP investments in FY 2022 will modernize Long Range Fires and Nuclear Test & Evaluation infrastructures. Long Range Fires modernization develops new capabilities to test the effectiveness of new materials and designs for long range ballistic/hypersonic weapon systems. Nuclear Enterprise modernization funding is directed at revitalizing DoD's nuclear effects test and evaluation simulators, M&S and other test capabilities needed to assess existing weapon systems, weapons modernization programs and other mission critical systems that must be tested against these effects.

FY 2022 includes increased investments in high-priority hypersonic ground and open-air range test capability, critically needed upgrades to DoD Threat Models and Simulations, High Energy Laser test facilities, Nuclear Effects simulators, and live/virtual unmanned autonomous systems.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Central Test and Evaluation Investment Program	381.356	423.206	550.140

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0604940D8Z / *Central Test and Evaluation Investment Program (CTEIP)*	**Project (Number/Name)** 940 / *Central Test and Evaluation Investment Program (CTEIP)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Description: Long Range Fires modernization will develop new capabilities to test the effectiveness of new materials and designs used in the leading edges and control surfaces of long range ballistic and hypersonic weapon systems in representative ground test environments. Repeated ground testing under a variety of simulated flight conditions is essential to developing designs with good mass properties and high survivability before undergoing expensive and time-consuming flight testing. Nuclear Enterprise modernization is directed at revitalizing DoD's nuclear effects test and evaluation simulators, M&S and other test capabilities needed to assess existing weapon systems, weapons modernization programs and mission critical system components that must be tested against these effects. Advanced Communication Threat Testing Suites Uplink Capability project develops an EW threat representative uplink jamming system for T&E of satellite system responsiveness against threat systems. In FY20, the project development initiated, procured material and a prime mover and conducted an interface subsystem test. Full Operation Capability (FOC) is planned in FY22. Accelerated Vehicle Durability Testing project develops a multi-axle vehicle chassis simulator and a drive train simulator in order to test 4 and 5 axle vehicle performance and reliability. In FY20, the project completed preliminary and critical design review and began construction of the simulator foundation. FOC is planned in FY22. Advanced Dynamic Transmitter Array project develops a suite of active electronically scanned array antennas to conduct EW testing using unique classified threat signals and dense EW environment at the Benefield Anechoic Chamber that cannot be conducted in open air testing. During FY20, the project completed a single stream test of RF components, continued subassembly manufacturing, assembly and test. The design has been transferred to the Air Force 412th EWG to assess options for future development. Advanced Range Tracking and Imaging System project develops 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. During FY20, the project completed a capability demonstration of the Fly-Out System and the Initial Design Review of the Close-In System. Initial Operational Capability is planned in FY22. The Short-Wave Infrared Zoom Lens project develops a short-wave infrared metric zoom lens to be mounted on multiple DoD tracking systems to track, determine effects phenomenology, and TSPI of aerial directed energy targets at night and in obscuration. During FY20, the project finalized the requirement, awarded the contract, and the developer completed design and initial manufacturing of the lens. FOC planned in FY21. Advanced Weapons Effects Test Capability project develops an array of high-speed cameras and fragment tracking software to accurately measure warhead fragments 2mm and above to establish higher fidelity for Joint Munitions Effects Manual (JMEM) damage and safety zones improving the warfighters' ability to effectively use the mix of weapons systems available. Capabilities will be delivered at Eglin AFB, FL, Aberdeen Proving Grounds, MD and China Lake, CA. During FY20, the project completed testing and installation at all three ranges. IOC was achieved in FY 2020. Air Warfare Battle Shaping project is a joint Navy, JSF, and TRMC development to provide a telemetry and real time casualty assessment capability similar to AARI-2 for F-35 OT at Pt Mugu, China Lake, and Edwards AFB. IOC was achieved in FY20.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0604940D8Z / *Central Test and Evaluation Investment Program (CTEIP)*	**Project (Number/Name)** 940 / *Central Test and Evaluation Investment Program (CTEIP)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Airborne Early-warning Interoperability Simulator project establishes an ISTF capability to emulate an operationally representative, dense radar target environment for injection-mode ground-testing of the E-2D mission system. In FY20, the project finalized the Clutter and Multipath remediation, site integration and FOC at NAS Patuxent River, MD. Autonomous Systems Test Capability - Ground project develops a Digital Robotic and Autonomous Systems Integrated Virtual Environment (DRIVE) for testing DoD autonomous ground vehicle systems and an open-air range Safety Environment, Engagement and Response (SEER) capability to safely test full scale autonomous vehicles. During FY20, the DRIVE sub-project completed architecture design, awarded development contracts and started work on Software Release 1. The SEER sub-project awarded the development contract. IOC is planned in FY22. Autonomy Integration and Teaming project develops a suite of capabilities furthering UAS systems integration into controlled airspace and the test tools for integrating manned-unmanned teaming between ranges. Capabilities will be delivered to NAS Patuxent River, MD, Redstone Arsenal, AL and Edwards AFB, CA. During FY20, the project completed CDR for the Guardian airspace control subproject and system requirements reviews for other subprojects. Subprojects will achieve FOC between FY22-25. Battlefield Awareness Testbed project develops a full-spectrum mobile laboratory with cross-domain tactical communications and network, data link, video, and mission data collection capability. In FY20, the project completed panning and long lead item procurements. IOC is planned in FY22. Closed Loop PESA Simulator project develops two transportable, closed-loop threat radar systems replicating the performance of a classified, widely fielded long-range surface-to-air missile system. IOC is planned in FY21 at Nevada Test and Training Range. FOC is at Eglin AFB, FL in FY22. The Navy has already fielded a fixed-site configuration at the Advanced Anti-aircraft Threat Simulator at China Lake, CA. The Air Force funded ARTV-2 mobile variant is based on this design. Common Modeling and Simulation Threat Environment for Long Range Strike (LRS) Family of Systems project upgrades constructive mission-level models to evaluate LRS Family of Systems survivability performance against a modern threat Integrated Air Defense System. IOC is planned in FY21. Common Range Integrated Instrumentation System (CRIIS) develops the next generation tracking system for DoD aircraft providing sub-meter Time-Space-Positioning Information (TSPI) accuracy and data bus information with four levels of Multiple Independent Levels of Security for testing aeronautical systems. CRIIS fielding to seven DoD ranges is underway during FY20. Also, during FY20, the CRIIS Operating System is being upgraded to Windows 10 compliance with DoD CIO requirements. IOC is FY21 with modernization efforts continuing FY21-26. Common Vehicle and Engagement Real-Time Test Instrumentation project reduces the size, weight and power for vehicle test data collection by replacing three unique data collectors with one modular, scalable data collector with increased storage capacity. In FY20, the project finished final modifications and completed production. This capability supported Abrams M1A2 System Enhancement Package (SEP) V3 and Bradley M2/M3A4 FOT&E during FY20, and will support future vehicle tests FY21-26.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0604940D8Z / *Central Test and Evaluation Investment Program (CTEIP)*	**Project (Number/Name)** 940 / *Central Test and Evaluation Investment Program (CTEIP)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Directed Energy Advanced Wideband System develops a wideband VHF test source to illuminate a full-sized aircraft for MIL-STD 464C vulnerability testing. During FY20, the project accelerated the build-out of 50 and 100 MHz modules. IOC is planned in FY21. Directed Energy S-Band Threat Source project develops a frequency agile S-band HPM threat source for MIL-STD 464C vulnerability testing. During FY20, the project completed requirements analysis and started the source selection process. IOC is planned in FY23. Dynamic DIADS Control of CEESIM software development project networks nodes of an existing classified threat air defense system. In FY20, this project completed a feasibility analysis and initiated development. IOC is planned in FY21. General Threat Torpedo project develops a threat representative torpedo vehicle that tactically and acoustically emulates threat torpedoes that are not currently available for surface or sub-surface ship testing. In FY20, the project completed demonstration of the High Speed Quiet Propulsion System. IOC planned in FY23. Government Radiometrically-Accurate Instrument for Laser Evaluation project develops a radiometrically accurate HEL diagnostic system for confirming performance of current and future HELs. During FY20, the project completed requirements analysis, contract award, and contract kick-off. IOC is planned in FY23. High Power Microwave E-Field Sensor project develops a portable wide area measurement system to test blue HPM effectiveness against airborne threats. During FY20, the project completed requirements analysis and contract award. IOC is planned in FY21. High Power Microwave VHF Threat Simulator project develops a test source to support wideband VHF MIL STD 464C testing of a full-sized target such as an aircraft. During FY20 the project started requirements development and planning. IOC is planned in FY23. Directed Energy High Speed Data Recorder project develops a high-speed data recording system for High Power Microwave directed energy testing. During FY20 the project started requirements development and planning. IOC in FY22. Directed Energy Remote Target Status Sensor develops a system capable of measuring HPM effects on internal components attacked by HPM systems. During FY20 the project started requirements development and planning. IOC in FY22. Directed Energy Tethered High-Power Microwave Recorder and Electronic Attack Target project accelerates development of instrumentation necessary for testing UAS vulnerabilities in an HPM threat environment. During FY20 the project started requirements development and planning. IOC in FY23. Dense Plasma Focus project develops an ultra-short pulse simulation capability to test the vulnerability of missile components to very short, intense bursts of neutrons from a fusion-based nuclear weapon. During FY20, the project conducted facility planning at White Sands Missile Range and prototype testing. IOC is planned in FY25. Direct Inject Jammer Common Operating Picture project develops a real-time situational awareness, data collection and analysis system for the Army Integrated Threat Force Direct Inject Jammer system to track health, status and geolocation information for test and training at JRTC, Ft Polk, LA and JMRC, Hohenfels, Germany. Development continued during FY20. FOC is planned in FY21.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0604940D8Z / *Central Test and Evaluation Investment Program (CTEIP)*	**Project (Number/Name)** 940 / *Central Test and Evaluation Investment Program (CTEIP)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Fast Burst Reactor Upgrade project develops new high purity, high enriched uranium rings and safety blocks for the fast burst reactor at White Sands Missile Range, NM to conduct neutron vulnerability testing of missile and other components. In FY20, the project completed the casting, machining, coating and delivery of two safety blocks and started development of the four rings. IOC is planned in FY24. Ground Based Radar Upgrade project funds design work to accelerate the radar radome replacement at the Reagan Test Site and provide system upgrades to enhance safety of flight and position information accuracies. During FY 20, the project started development of necessary engineering design drawings. Global Position System Localized EW Emitter develops a low power, vehicle mounted GPS jamming capability for testing of ground vehicle communications and navigation systems against GPS jamming. System to be fielded to the Army's Integrated Threat Force. FOC FY20. Hypersonic Test Capability Improvement project develops a clean air, variable Mach ground test capability from Mach 4 to Mach 7.5 in 3 Blocks for DT&E of hypersonic boost glide and scramjet weapon systems. In FY20, the project continued the development of Block 1. IOC is planned in FY23. Mid Pressure Arc Heater Upgrade develops and installs a new Power Supply in the DoD H2 Hypersonic Test Facility at Arnold AFB, TN and enables this arc heater to conduct longer run times on larger test articles to support thermal protection system testing of hypersonic systems. In FY20, the project awarded the development contract and completed 10% and 30% design reviews. IOC is planned in FY23. Mach 18 test capability at the AEDC Tunnel 9 development provides aerodynamic and aerothermal data to support boost glide weapon systems, conventional prompt strike, and maneuvering reentry vehicles. IOC achieved in FY20. G Range Weather Effects project upgrades the current G-Range test track to provide a small-scale rain and snow erosion test capability to validate vehicle structural design. In FY20, the project completed the design, development, and delivery of rain and ice shakers. IOC is planned in FY21. High Speed Test Track Weather Effects project develops a full-scale rain erosion capability to validate vehicle structural design and qualify hypersonic weapon systems for flight in an open-air facility at Holloman AFB. In FY20, the project completed installation and acceptance testing at the High-Speed Test Track. In FY21, the project plans to conduct full system demonstration runs. IOC FY21. High Altitude LIDAR Atmospheric Sensing - Ground Based project provides DOD test ranges with the design for a LIDAR-based instrumentation system that improves measurements of atmospheric conditions for launch and recovery operations. In FY20, the project completed the PDR. M&S for Maneuvering Boost Glide Vehicles - Transient Thermal Analysis Software project upgrades a tool set improving capabilities for predicting aerothermal and ablation response to high speed, high temperature flow in ground and flight test environments. In FY20, the project completed delivery of Level 2 software to over 20 customers for IOC.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0604940D8Z / *Central Test and Evaluation Investment Program (CTEIP)*	**Project (Number/Name)** 940 / *Central Test and Evaluation Investment Program (CTEIP)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
M&S Enhancements Weather Effects project develops advanced material response models validated with ground test data to predict weather erosion in flight. In FY20, the project completed upgrade of the Particle Impact Test Facility and completed weather test planning support for G-Range and the High-Speed Test Track. Reconfigurable RF Target Simulator project upgrades an Eglin AFB facility to test prototype sensors in a simulated hypersonic target and scene environment. In FY20, the project completed development of the array wall and integration of RF sensors. Aerodynamic and Propulsion Test Unit -Freejet Calibration project develops instrumentation for and calibrates the APTU Mach 6.4 freeject nozzle pressure and temperature profiles as a baseline for customer testing. In FY20, the project completed planning and initiated development. High Pressure Air Compressor project provides additional air compressor capability at AEDC to reduce recharge time from 13 to 8 hours resulting in more test runs per week at the AEDC Aerodynamic and Propulsion Test Unit (APTU) and J5 facilities. In FY20, air compressor development was completed and delivered. IOC is planned in FY23. Hypersonic Tunnel Facility Plum Brook project initiates efforts to re-activate the NASA Glenn hypersonic wind tunnel in Sandusky, Ohio. In FY20, the project secured an Interagency Agreement with NASA to complete an engineering study of the facility. IOC is planned in FY26. Joint Economical Sled Track Rocket project develops a new modular propulsion system for the three DoD high speed test tracks including an improved capability to ground test full scale components at hypersonic speeds. In FY20, the project completed requirements development and acquisition planning. Development contract will be awarded in FY21. IOC in FY23. Improved Encrypted Flight Termination System for hypersonic weapons tracking and flight safety development was initiated in FY20 as part of a larger Range Safety system upgrade for the Reagan Test Site for supporting hypersonic weapons testing. IOC is planned in FY22. Reagan Test Site Non-Ballistic Radar Tracking project develops advanced, non-ballistic tracking algorithms and the supporting infrastructure to track non-ballistic Hypersonic vehicles vs. current ballistic re-entry vehicle flight paths. Development was initiated in FY20. IOC is planned in FY22. Integrated Air Defense Systems Enhancements and Networked Threat Emulation project develops a comprehensive threat-representative Integrated Air Defense System capability at the Electronic Combat Range, China Lake and other facilities providing four threat-representative Command Posts to existing EW capabilities. FOC is planned in FY21. IR and RF Threat Modeling and Simulation Project upgrades 10 Radio Frequency and 10 Infrared authoritative Intelligence Community missile models supporting the DoD Threat Model Analysis Program (TMAP), Enhanced Missile SIGnature (EMSIG) and other high-fidelity seeker models. FOC is planned in FY23. Joint Electronic Warfare Cyber Techniques, Effects and Characteristics development provides an EW Radio Frequency and Cyber effects test environment for Electromagnetic Maneuver Warfare. Development was initiated in FY20. IOC is planned in FY22. Joint Electronic Warfare Digital Integrated Air Defense System (DIADS) Integration upgrades DoD's DIADS System M&S capacities to support expansion of EW testing across western test ranges. Development was imitated in FY20. IOC is planned in FY21.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0604940D8Z / *Central Test and Evaluation Investment Program (CTEIP)*	**Project (Number/Name)** 940 / *Central Test and Evaluation Investment Program (CTEIP)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Joint Electronic Warfare Mobile Radar System Target Engagement Radar development was initiated in FY20 to evaluate alternatives and prototype development. Initial results in FY21. Joint Electronic Warfare Advanced Programmable Threat Radar AoA was initiated in FY20, and will be complete in FY21. Joint Electronic Warfare Airborne Instrumentation Interoperability development was initiated in FY20 to maximize airborne instrumentation interoperability between the CTEIP developed Common Range Integrated Instrumentation Systems (CRIIS) and Air Force/Navy Tactical Combat Training System-II (TCTS-II), and establish blueprint for merging baselines into a common system. Development will continue in FY21-26. Joint Electronic Warfare Open Air Battle Shaping development was initiated in FY20 to establish an enterprise architecture and approach to implement multi-range aircraft instrumentation interoperability and network connectivity to meet test and training needs for air warfare missions. This includes upgrading aircraft instrumentation and multi-range aircraft compatibility needed to provide enlarged, interoperable battlespace as aircraft transit multiple ranges during a large-scale test and training scenarios. Development will continue FY21-26. Joint Electronic Warfare Multi-Lab EW Integration development was initiated in FY20 to integrate key EW test facilities and assets at NAS Pt. Mugu, CA in order to expand land and sea range EW testing. IOC is planned in FY21. Mid- Pressure Arc Heater project development expands the DoD H2 Hypersonic Test Facility to provide higher enthalpy at the mid-pressure altitudes to enable ground testing of Prompt Global Strike, Maneuvering Reentry Vehicles, and SCRamJet components such as nose cones, other leading-edge surfaces, and fins. IOC was achieved in FY 2020. Mobile High Energy Laser Measurement project is comprised of seven development efforts for testing High Energy Lasers including: the measurement of beam irradiance on various classes of UAV targets (Subsonic, Supersonic, Small UAS, etc.), mobile ground diagnostics, and test tools. During FY20 all subprojects continued development. IOCs related to each development effort FY21-25. Naval Autonomous Systems Test Capability project establishes an M&S capability to test the performance of Naval surface ship autonomous systems software. During FY20 project requirements and planning was initiated. IOC is planned in FY24. Next Generation Electronic Warfare Environment Generator project develops a high fidelity, modular, scalable, reconfigurable EW environment generator for HWIL and ISTF EW systems testing. Development was completed in FY20 with IOC at NAS Patuxent River, MD. Additional systems to be fielded at DoD test facilities FY21-26. Net Centric Warfare T&E Environment project develops an operationally representative modeling and simulation environment to evaluate the full kill chain for net-centric weapons with realistic network loading and radio frequency effects. FOC in FY20. Open-Air Multi-Spectral Data Collection project develops an open-air test capability for T&E of integrated multi-spectral threat warning receivers and infrared countermeasures against complex multi-spectral threats. Development includes the ability to characterize performance of FLIR targeting, laser designator, illuminator and laser range finder systems. Project planning was completed in FY20. Sub-project IOCs are planned FY22-23. Over Water Impact and Location Scoring System project develops an ocean-going weapons impact scoring system to provide persistent, relocatable range capability for open-ocean, beyond line of sight, high precision weapon scoring and range			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0604940D8Z / *Central Test and Evaluation Investment Program (CTEIP)*	**Project (Number/Name)** 940 / *Central Test and Evaluation Investment Program (CTEIP)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
surveillance. Development was initiated and project planning completed and long lead material items were procured in FY20. IOC is planned in FY24. Radar Air-to-Ground Environment project development is comprised of three blocks for testing high-density air-to-air (A/A), air-to-ground (A/G) and advanced signals (AS) in an ISTF environment. The radar environment simulator will provide digital radio frequency memory devices that capture, store, delay, scale, and return radar signals to the radar under test. During FY20, all three blocks of development completed separate Critical Design Reviews. FOC is planned in FY22. Radar Cross Section Range Relevance project is comprised of eleven development efforts providing upgraded and new RCS measurement capabilities to measure and evaluate advanced low observable technologies in increasingly complex and cluttered environments. During FY20, the Atlantic Test Range completed PDR and the National RCS Test Facility completed the digital signal processing, fiber optic, full site perimeter security subprojects. FOC is planned in FY24. Swarm Autonomy and Scoring project develops semi-autonomous control for the Navy's High-Speed Maneuverable Surface Target (HSMST) enabling a single operator to control up to 8 HSMST providing cost savings and significantly greater formation accuracy and a new UAV-based overhead scoring capability for testing ship self-defense ship weapon systems and weapon impacts against representative surface swarming threats. FOC FY20. Scene Projector development to improve high fidelity, high temperature scene protectors for installed system and hardware in the loop laboratory testing of sensors and seekers for high speed weapons and missile engagements continued development during FY20. IOC is planned in FY26. Counter Unmanned Aerial System (cUAS) project develops of a prototype high-fidelity X-band radar for tracking cUAS capabilities against commercially available small UAS. The project provides a Common Operating Picture system for real-time awareness, data collection and analysis. Development was initiated and CDR completed in FY20. IOC is planned in FY21. Adaptable Multi-Band Asset for Global Navigation Satellite System project develops a threat representative multi-modal global navigation satellite system jammer to provide denial and deception jamming of PNT information during operational test and training. In FY20, development was initiated with design complete through CDR. IOC is planned in FY21. Quantum Encryption Key project is a proof of concept prototype demonstration of quantum technology encryption key distribution to secure communication system's transmissions. QKD completed CDR and a brass board bench test capability in FY20. Prototype IOC is planned in FY22. Threat High Output Repeater Extender project develops a threat representative, high-power, cover/knock-off jammer to provide denial and deception jamming during operational test and training. A prototype system completed site acceptance testing during FY20. IOC is planned in FY21. Ground Unattended Threat Sensor Suite project develops an array of threat representative acoustic, seismic, magnetic, and video sensors with real time awareness, data collection and analysis for test and training. Development was initiated during FY20, and an analysis of alternatives completed. IOC is planned in FY21.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0604940D8Z / *Central Test and Evaluation Investment Program (CTEIP)*	**Project (Number/Name)** 940 / *Central Test and Evaluation Investment Program (CTEIP)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Cyber Operational Resiliency Assessment Platform project develops a cyber- electronic warfare operational resiliency assessment capability for the Army Threat Systems Management Office. Development was initiated in FY20. IOC is planned in FY21. Capability assessments will continue FY21-23. Electronic Attack-5G development provides a threat representative Electronic Attack capability against 5G systems for denial, degradation and deception of service attacks during operational test and training. In FY20, development was initiated and initial project planning completed. FOC is planned in FY23. RF-enabled Cyber-Physical Toolkit development provides an RF-enabled attack and exploitation, data collection and analysis capability to evaluate systems under test during operational test and training. In FY20, development was initiated and project planning completed. FOC is planned in FY23. Cyber Tools for Aviation RF Access Points project develops a suite of cyber-attack tools to stimulate both civil and military IFF/ GPS RF access points and semi-automatically identify abnormalities in the MIL-STD-1553 data traffic from cyber-attacks. This project was completed and successfully demonstrated the cyber test capability on an Apache helicopter in FY20. Cyber Battlefield Operations Support System BOSS develops a Mil-Std compliant data link test application to validate platform interoperability across Link 16, VMF, SADL and JREAP as well as other data link protocols. During, FY20, the project validated requirements and awarded the contract for cyber applications. IOC is planned in FY21. Full Authority Digital Engine Control (FADEC) Tool project develops an MH-53K Sea Stallion FADEC test bench and cyber tools to assess the cyber vulnerabilities of the main communication and control channels and data links. In FY20, the project delivered the MH-53K FADEC test bench. IOC is planned in FY21. Network, System Integration and Test Environment (NSITE) – Cyber Test Capabilities project expands the NSITE application to include cyber capabilities to: monitor, check for, alert on, identify messaging, and identify the source of the messaging, that is modified, or indicates a modification (“tip-off” capability). During FY20, the project was completed and available to NSITE users. IOC is FY20. Radio Frequency (RF) Replay Tool develops cyber tool set to support evaluation of 1 to 5GHz systems by providing streaming file access for both read and write of multiple signal formats as well as FPGA support for very short capture and replay where time is of the essence. During FY20, the project completed development, was demonstrated a representative test environment and delivered a complete hardware list, software suite, and accurate installation directions. IOC is FY20. Satellite Communications Tool project acquires two SATCOM systems (INMARSAT and Iridium) and develops of a common toolset to evaluate the impact of cyber-attacks against SATCOM systems on air platform performance. The project was initiated in FY20. IOC is planned in FY21. Weapon Cyber Test Tool Set project develops cyber test capability for weapon and aircraft systems for MIL-STD-1553B (Ripley and OSCAR enhancement), Controller Area Network (CAN) bus in fire control and stores management roles 1553 Enhanced Bit Rate (EBR) and IEEE 1394 (FireWire). The project was initiated in FY20. IOC is planned in FY22. X-Ray Simulator for Test and Evaluation of Nuclear Survivability project replaces and upgrades three DoD X-ray simulators that measure the susceptibility of missile components to damage from high dose warm and cold x-rays experienced in space. In FY20,			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0604940D8Z / *Central Test and Evaluation Investment Program (CTEIP)*	**Project (Number/Name)** 940 / *Central Test and Evaluation Investment Program (CTEIP)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
the project completed project planning, source selection and contract award for replacing DTRA's Double Eagle simulator. IOC is planned in FY23. ***FY 2021 Plans:*** Advanced Communication Threat Testing Suites Uplink Capability. During FY21, the project will complete development and begin integration and testing. This capability will support Family of Advanced Beyond-Line-Of-Sight Terminals FOT&E in FY22. Accelerated Vehicle Durability Testing project will perform initial demonstrations for both the chassis and drivetrain simulators are planned for FY 21 and Full Operational Capability (FOC) is planned in FY22. Advanced Dynamic Transmitter Array project. During FY21-22 the 1st unit will complete manufacturing, Factory Acceptance Test, Site integration and acceptance for Initial Operational Capability (IOC) at Edwards AFB with the production contract for remaining to be awarded in FY22. FOC is planned for FY25. Advanced Range Tracking and Imaging System project. During FY21 the Fly-Out System will complete assembly and testing. The Close-In System will complete its Final Design Review, assembly and test and deployment to the White Sands Missile Range, NM. The Short-Wave Infrared Zoom Lens project. During FY21 lens development will complete contractor testing, delivery, and integration. IOC/FOC is planned in FY21. Air Warfare Battle Shaping project. Initial capability was delivered in FY20, with follow-on projects planned over FY21-24 expanding this capability across land and sea ranges. Autonomous Systems Test Capability. In FY21 the DRIVE sub-project will compete Release 1 and 2, and start Release 3. The SEER sub-project will complete its System Requirements Review, PDR and CDR. During FY22 the DRIVE sub-project will complete Releases 3, 4, and 5. The SEER sub-project will complete assembly and test. Both sub-systems will be fielded at Aberdeen Proving Grounds, MD. IOC of both systems is planned in FY22. Autonomy Integration and Teaming project. During FY21 all subprojects will complete PDR and CDR. The Navy SATCOM test tools subproject will complete in FY21. In FY21 the Manned-Unmanned Teaming (MUMT) project will field early testing capability between Redstone Test Center and Dugway Proving Grounds enabling testing without ferrying Apache helicopters between sites, reducing cost of test. Remaining subprojects will achieve FOC FY22-25. Battlefield Awareness Testbed project. In FY21, the project will complete design and development. IOC is planned in FY22. Big Data/Knowledge Management project will continue development of Big Data/Knowledge Management tools, analytic techniques, resources, policies and procedures needed to more efficiently and effectively use T&E data during FY21-26. Closed Loop PESA Simulator project develops two transportable, closed-loop threat radar systems replicating the performance of a classified, widely fielded long-range surface-to-air missile system. IOC is planned in FY21 at Nevada Test and Training Range. FOC is at Eglin AFB, FL in FY22. The Navy has fielded a fixed-site configuration at the Advanced Anti-aircraft Threat Simulator at China Lake, CA. The Air Force funded ARTV-2 mobile variant is based on this design.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0604940D8Z / *Central Test and Evaluation Investment Program (CTEIP)*	**Project (Number/Name)** 940 / *Central Test and Evaluation Investment Program (CTEIP)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Common Modeling and Simulation Threat Environment for Long Range Strike (LRS) Family of Systems project. IOC is planned in FY21. Common Range Integrated Instrumentation System (CRIIS). In FY21 over 400 CRIIS subsystems will be delivered and CRIIS integration on the F-15E, F-16, F-18, F-22 will be IOC. CRIIS fielding to seven DoD ranges completes in FY21 for FOC. CRIIS will be interoperable with the Tactical Combat Training System (TCTS)-II system expanding usable range space and assets for multi-range missions once TCTS-II is fielded in FY23. Modernization efforts will continue FY23-26. CRIIS Operating System Upgrade is a development upgrading the CRIIS pod fleet to Windows 10 in compliance with DoD CIO requirements. In FY21 the upgrade will be tested and installed in CRIIS systems at all seven ranges. IOC in FY21. CRIIS Users Post Mission Processing Tool development provides advanced GPS correction techniques to achieve greater post flight TSPI accuracy for onboard GPS-IMU data captured during a CRIIS supported mission. Development will be initiated in FY21 and delivered during FY22. Common Vehicle and Engagement Real-Time Test Instrumentation project will support future vehicle tests FY21-26. Directed Energy Advanced Wideband System develops a wideband VHF test source to illuminate a full-sized aircraft for MIL-STD 464C vulnerability testing. In FY21 the 50 and 100 MHz modules will be delivered and tested. IOC is planned in FY21. Directed Energy S-Band Threat Source project. In FY21, the project will award a development contract and complete PDR and CDR. In FY22, the project will complete assembly, and contractor testing. In FY23, the project will conduct final integration and system acceptance testing and achieve IOC. Dynamic DIADS Control of CEESIM software development project. During FY21, the project will complete Factory Acceptance Test and FOC at Tinker AFB. General Threat Torpedo project. During FY21-22, the project will continue development with IOC planned in 2QFY23. Government Radiometrically-Accurate Instrument for Laser Evaluation project. In FY21 the project will complete its System Requirements and Preliminary Design Reviews. Project will achieve IOC in FY22. High Power Microwave E-Field Sensor project. In FY21 the project will complete design, build, and system acceptance testing. IOC is planned in FY21. High Power Microwave VHF Threat Simulator project. Development will continue during FY21-23. IOC is planned in FY23. Directed Energy High Speed Data Recorder project. Development will continue during FY21-22. IOC is planned in FY22. Directed Energy Remote Target Status Sensor project. Development will continue during FY21-22. IOC is planned in FY22. Directed Energy Tethered High-Power Microwave Recorder and Electronic Attack Target project. Development will continue during FY21-22. IOC is planned in FY23. Dense Plasma Focus project. During FY21 full development is expected to start with PDR late in the year. In FY22 detailed design will continue with a CDR in FY23. Full fabrication and integration are planned for FY24 with IOC in FY25. Direct Inject Jammer Common Operating Picture project. FOC FY2021. Fast Burst Reactor Upgrade project. In FY21 ring development and production will continue sequentially with final delivery and FOC planned in FY24.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0604940D8Z / *Central Test and Evaluation Investment Program (CTEIP)*	**Project (Number/Name)** 940 / *Central Test and Evaluation Investment Program (CTEIP)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Ground Based Radar Upgrade project. During FY21, the project will complete the necessary engineering design drawings will be completed and provided to Army for use to establish a production contract. Hypersonic Test Capability Improvement project. In FY21 and FY22, the project will continue design, development, and fabrication, and testing with an IOC demonstration in FY23. Mid Pressure Arc Heater Upgrade project. Development will continue FY21-22 with IOC planned in FY23. Mach 18 test capability at the AEDC Tunnel 9. During FY21 additional materials needed to meet customer test requirements will be procured. G Range Weather Effects project. In FY21, the project will complete integration and conduct test runs as well as procure the long lead consumables and spare parts necessary to re-activate the facility and meet customer test needs. IOC is planned in FY21. High Speed Test Track Weather Effects project. In FY21, the project will conduct full system demonstrations. IOC is planned in FY21. High Altitude LIDAR Atmospheric Sensing - Ground Based project. In FY21 the project plans to complete the design, have it approved by the Government, and make the design available to ranges for purchase. M&S for Maneuvering Boost Glide Vehicles - Transient Thermal Analysis Software project. In FY21, the project plans to deliver FOC Level 3 software and complete the project. M&S Enhancements Weather Effects project. In FY21 the project will complete the weather database and provide analysis in support of weather test events concluding the project. Reconfigurable RF Target Simulator project. In FY21 the project will complete development of representative target scenes and complete integration and test of the facility concluding the project. Aerodynamic and Propulsion Test Unit-Freejet Calibration project. In FY21, the project will install and test the instrumentation and complete calibration. High Pressure Air Compressor project provides. In FY21-22, the air compressors will be installed and tested. Hypersonic Tunnel Facility Plum Brook project. In FY21, the project will complete the engineering study and start re-activation planning. Follow-on development activities will take place FY22-26. Joint Economical Sled Track Rocket project. In FY21, the project will complete source selection, contract award and Increment 1 PDR. In FY22, the project plans to complete Increment 1 CDR, prototype development and test. If ready, development on Increments 2 thru 4 will also start in FY22. Development and test of Increments 2 thru 4 will continue in FY23 and FY24. Improved Encrypted Flight Termination System for hypersonic weapons tracking and flight safety. Development will continue during FY21-22. IOC is FY22. Reagan Test Site Non-Ballistic Radar Tracking project. Design, development and testing will be completed in FY21. IOC is planned in FY22. Integrated Air Defense Systems Enhancements and Networked Threat Emulation project. FOC is planned in FY21 with a large multi-range demonstration. IR and RF Threat Modeling and Simulation Project continues upgrades in FY21. FOC is planned in FY23.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0604940D8Z / *Central Test and Evaluation Investment Program (CTEIP)*	**Project (Number/Name)** 940 / *Central Test and Evaluation Investment Program (CTEIP)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Joint Electronic Warfare Threat Integrated Air Defense Systems Radar Simulator development to expand open air test capability will be initiated in FY2021. This development acquires additional X, VHF, and UHF RF open-loop, transmit-only radar simulators to meet customer and threat laydown requirements. Acquisition and integration of these simulators onto multiple land ranges will continue in FY22-25. FOC is planned in FY25. Joint Electronic Warfare Cyber Techniques, Effects and Characteristics program. Development will continue FY21-22. IOC is planned in FY22 at NAS Pt Mugu, CA. Joint Electronic Warfare Digital Integrated Air Defense System (DIADS) Integration upgrades. Phase I will complete in FY21 with FY22-25 developments to be determined. Joint Electronic Warfare Mobile Radar System Target Engagement Radar will continue during FY21 with a PDR level design to establish cost and risk of continued development. A decision on continued development FY22-25 will be made in FY21. Joint Electronic Warfare Advanced Programmable Threat Radar AoA will be complete in FY21 with a decision on continued FY22-26 development during FY21. Joint Electronic Warfare Airborne Instrumentation Interoperability will continue development during FY21-23 to maximize airborne instrumentation interoperability between the CTEIP developed Common Range Integrated Instrumentation Systems (CRIIS) and Air Force/Navy Tactical Combat Training System-II (TCTS-II), and establish blueprint for merging baselines into a common system when TCTS-II is fielded in FY23. Joint Electronic Warfare Open Air Battle Shaping development to establish an enterprise architecture and approach to implement multi-range aircraft instrumentation interoperability and network connectivity to meet test and training needs for air warfare missions will continue FY21-26. This includes upgrading aircraft instrumentation and multi-range aircraft compatibility needed to provide enlarged, interoperable battlespace as aircraft transit multiple ranges during a large-scale test and training scenarios. Joint Electronic Warfare Multi-Lab EW Integration development will complete for IOC in FY21, with follow-on efforts planned in FY22-26. Mid- Pressure Arc Heater project development. During FY21, CTEIP will continue to support customer testing man power needs, order additional spares and start work on an additional Control Room. Mobile High Energy Laser Measurement project. In FY21, three sub-projects plan to complete development, test and achieve IOC including two laser target boards. In FY21-22, the project will initiate four sub-projects including a supersonic target board and portable laser instrumentation called Range-in-a-Box. In FY23, the project will complete development, testing and achieve IOC on the final four sub-projects including tools to support range safety and small target boards for a variety of targets. Naval Autonomous Systems Test Capability project. During FY21, the project will establish system requirements, conduct project planning, and initiate development. Development will continue in FY22-24. IOC is planned in FY24. Next Generation Electronic Warfare Environment Generator project. Acquisition and integration at the Navy's ECSEL will take place in FY21 and Air Force BAF in FY22. FOC is planned in FY22. Open-Air Multi-Spectral Data Collection project. Development of multiple subsystems will be initiated in FY21, with sub-project IOCs in the FY22-23 timeframe.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0604940D8Z / *Central Test and Evaluation Investment Program (CTEIP)*	**Project (Number/Name)** 940 / *Central Test and Evaluation Investment Program (CTEIP)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Over Water Impact and Location Scoring System project. During FY21, the project will complete and demonstrate an initial prototype capability and continue spiral 2 development. During FY21-23, each spiral will demonstrate incremental capability. FOC FY24. Radar Air-to-Ground Environment project. In FY21, both the A/A and A/G blocks will achieve FOC. The A/S block will IOC in FY21 and FOC in FY22. Radar Cross Section Range Relevance project. During FY21-23 the Atlantic Test Range will complete CDR and system development with FOC in FY24. In FY21 the National RCS Test will complete and the dynamic RCS measurement system subproject will be initiated. NRTF subprojects will reach FOC in FY22. Spectrum Stewardship project will continue participation FY21-25 in domestic and international forums for spectrum management, frequency allocations and spectrum interference that impact DoD test and evaluation ranges to ensure DoD T&E spectrum concerns are addressed. Scene Projector development will continue FY21-26. Counter Unmanned Aerial System (cUAS) project. During FY21, a prototype will be demonstrated and fielded. Adaptable Multi-Band Asset for Global Navigation Satellite System project. During FY21, the project will complete a laboratory unit, finalize software integration, acceptance testing and deliver three systems. Quantum Encryption Key project. In FY21, prototype factory acceptance testing and proof of concept demonstration will be completed. IOC is planned in FY22. Threat High Output Repeater Extender project. During FY21, the production contract will be awarded and three units delivered. IOC is planned in FY21. Ground Unattended Threat Sensor Suite project. During FY21, development, integration and site acceptance will be completed. IOC is planned in FY21. Cyber Operational Resiliency Assessment Platform project. During FY21, the analysis tool and database will be delivered and assessment team established and training. IOC is planned in FY21. Electronic Attack-5G development. During FY21, the project will complete a Threat Validation Report and digital attack system CDR. In FY22, the project will complete site acceptance of the digital attack system and CDR for the Physical RF Interface Electronic Attack System. FOC is planned in FYF23. RF-enabled Cyber-Physical Toolkit development. During FY21, a Threat Support Package and two classified effects payloads will be delivered. During FY22, digital access development for attack payloads will be completed. During FY23, the RF access development for attack payloads will complete. FOC is planned in FY23. Cyber Battlefield Operations Support System BOSS. The project will complete in FY21 and be available to any BOSS User. Full Authority Digital Engine Control (FADEC) Tool project. In FY21, the project will complete development and reach IOC. Satellite Communications Tool project. In FY21, the project will deliver INMARSAT and Iridium SATCOM cyber test benches and common cyber tools. IOC is planned in FY21.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0604940D8Z / *Central Test and Evaluation Investment Program (CTEIP)*	**Project (Number/Name)** 940 / *Central Test and Evaluation Investment Program (CTEIP)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Weapon Cyber Test Tool Set project. During FY21-22, the project will deliver hardware interface devices, associated software packages and User Manuals. IOC is FY22. X-Ray Simulator for Test and Evaluation of Nuclear Survivability project. In FY21, the project plans to complete PDR for DTRA's Double Eagle simulator, order long lead parts and start critical design. In FY22-23, the project will complete critical design, and conduct fabrication and testing with IOC in FY23. Also, in FY22-23, project planning will start on the second and third simulator developments, Pithon II and Gamble III. During FY21-26 CTEIP will initiate additional development activities for testing critical weapon systems that align to the NDS, USD(R&E) and Service priorities. These efforts will be in the areas of Hypersonics, Directed Energy, Cyber Security, Electronic Warfare, Missile Defense, Nuclear Effects, Space, Autonomy, Command/Control and Communications and critical range instrumentation infrastructure. FY21 new efforts include: Bindle Linux Harness Automation cyber test tools for evaluating Linux based Systems Under Test. Instrumentation for Cyber EW Test Assets to validate Cyber-EW techniques, attack surface, and protection-measures for Systems Under Test. Lawrence Livermore Labs Independent Diagnostic Scoring System (LIDSS) Radar on a Raft Motion Compensation to test the Doppler Radar and stabilization system. Transportable Space Range Operations to develop a standardized, deployable system for generating complex, realistic SATCOM environments (open air and closed loop), range control, and instrumented data collection to support test, training and evaluation of Space EW systems and operators. Counter UAS Jamming Operations to establish a signal generation capability for testing counter UAS systems in representative open-air range electronic warfare environments. Single Event Effects Facility for Rare Isotope Beams upgrade increasing capabilities and capacity for evaluating radiation hardening of electronic components.			
FY 2022 Plans: Long Range Fires modernization funding develops new capabilities to test the effectiveness of new materials and designs used in the leading edges and control surfaces of long range ballistic and hypersonic weapon systems in representative ground test environment. Repeated ground testing under a variety of simulated flight conditions is essential to developing designs with good mass properties and high survivability before undergoing expensive and time-consuming flight testing. Nuclear Enterprise modernization funding is directed at revitalizing DoD's nuclear effects test and evaluation simulators, M&S and other test capabilities needed to assess existing weapon systems, weapons modernization programs and mission critical system components that must be tested against these effects. In addition to already ongoing projects, other efforts being evaluated for FY22 include: Hybrid Tracking Systems for use in GPS denied environments.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0604940D8Z / *Central Test and Evaluation Investment Program (CTEIP)*	**Project (Number/Name)** 940 / *Central Test and Evaluation Investment Program (CTEIP)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Technology Refresh for the Reagan Test Site Kiernan Reentry Measurements Site. Interactive CNI RF Environment Stimulator for testing IFF and other CNI signals in HWIL and ISTF. Development of a reprogrammable closed-loop threat radar prototype for RF system test and evaluation in all digital HWIL, ISTF. Development of a federated test bed to evaluate Defensive / Offensive Capability for Space. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** 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. Joint Electronic Warfare Test Initiatives 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	381.356	423.206	550.140

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 0604942D8Z / *Assessments & Evaluations*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	256.566	30.064	18.368	17.980	-	17.980	-	-	-	-	Continuing	Continuing
805: *Assessments & Evaluations*	241.629	15.999	-	-	-	-	-	-	-	-	-	-
822: *Director, Special Programs (DSP)*	2.668	3.797	10.235	4.680	-	4.680	-	-	-	-	-	-
823: *National Assessment Group (NAG)*	12.269	10.268	8.133	13.300	-	13.300	-	-	-	-	-	-

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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	30.834	18.379	18.524	-	18.524
Current President's Budget	30.064	18.368	17.980	-	17.980
Total Adjustments	-0.770	-0.011	-0.544	-	-0.544
• Congressional General Reductions	-	-0.011			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Program Adjustments	-0.770	-	-0.544	-	-0.544

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0604942D8Z / *Assessments & Evaluations*	Project (Number/Name) 805 / *Assessments & Evaluations*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
805: *Assessments & Evaluations*	241.629	15.999	-	-	-	-	-	-	-	-	-	-
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 2020	FY 2021	FY 2022
Title: Assessments & Evaluations ***Description:*** Detailed Information is Classified.	15.999	-	-
Accomplishments/Planned Programs Subtotals	15.999	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0604942D8Z / *Assessments & Evaluations*	Project (Number/Name) 822 / *Director, Special Programs (DSP)*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
822: *Director, Special Programs (DSP)*	2.668	3.797	10.235	4.680	-	4.680	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Classified Program.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Director, Special Program	3.797	10.235	4.680
Description: Detailed Information is Classified. ***FY 2021 Plans:*** Detailed information is Classified. ***FY 2022 Plans:*** Detailed information is Classified. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Details are Classified.			
Accomplishments/Planned Programs Subtotals	3.797	10.235	4.680

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0604942D8Z / *Assessments & Evaluations*	Project (Number/Name) 823 / *National Assessment Group (NAG)*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
823: *National Assessment Group (NAG)*	12.269	10.268	8.133	13.300	-	13.300	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Classified program.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: National Assessment Group (NAG)	10.268	8.133	13.300
Description: Detailed information is Classified. ***FY 2021 Plans:*** Detailed information is Classified. ***FY 2022 Plans:*** Detailed information is Classified. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Details are Classified.			
Accomplishments/Planned Programs Subtotals	10.268	8.133	13.300

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 0605100D8Z / *Joint Mission Environment Test Capability (JMETC)*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	346.266	87.776	79.046	71.410	-	71.410	-	-	-	-	-	-
087: *JMETC Distributed Test*	195.018	17.623	14.819	13.505	-	13.505	-	-	-	-	-	-
088: *JMETC National Cyber Range (NCR) Complex*	151.248	70.153	64.227	57.905	-	57.905	-	-	-	-	-	-

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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	89.091	79.046	80.101	-	80.101
Current President's Budget	87.776	79.046	71.410	-	71.410
Total Adjustments	-1.315	0.000	-8.691	-	-8.691
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Program Adjustment	-1.315	-	-8.691	-	-8.691

Change Summary Explanation

The FY 2022 funding request was reduced by $7.538 million to account for the availability of prior year execution balances.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605100D8Z / *Joint Mission Environment Test Capability (JMETC)*	Project (Number/Name) 087 / *JMETC Distributed Test*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
087: *JMETC Distributed Test*	195.018	17.623	14.819	13.505	-	13.505	-	-	-	-	-	-
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 2020	FY 2021	FY 2022
Title: JMETC Distributed Test	17.623	14.819	13.505
Description: The JMETC Distributed Test project continued expansion of the JMETC Secret Network (JSN) infrastructure to meet requirements. 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. 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 enterprise information systems. 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 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0605100D8Z / *Joint Mission Environment Test Capability (JMETC)*	**Project (Number/Name)** 087 / *JMETC Distributed Test*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
The JMETC Distributed Test project refined 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. ***FY 2021 Plans:*** The JMETC Distributed Test project will continue to optimize the JMETC Secret Network (JSN) infrastructure to meet requirements, adding additional sites as needed. 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. 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 enterprise information systems. 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. The JMETC Distributed Test project will continue to develop post-test enterprise service capabilities, to include Knowledge Management and Big Data Analytics tools and technologies, in support of JMETC customer needs and requirements. An enterprise framework will continue to be developed for Big Data Analytics tools and technologies. ***FY 2022 Plans:*** The JMETC Distributed Test project will continue to optimize the JMETC Secret Network (JSN) infrastructure to meet requirements, adding or removing sites as necessary. The JMETC Distributed Test project will continue supporting DoD distributed test and training events. The JMETC Distributed Test project will continue providing test planning support to users and organizations to conduct interoperability testing on numerous DoD systems. 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.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0605100D8Z / *Joint Mission Environment Test Capability (JMETC)*	**Project (Number/Name)** 087 / *JMETC Distributed Test*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
The JMETC Distributed Test project will continue to modernize post-test enterprise service capabilities, to include Knowledge Management and an enterprise framework for updated Big Data Analytics tools and technologies, in support of JMETC customer needs and requirements. The JMETC Distributed Test project will continue to support new and emerging acquisition programs. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The FY 2022 funding request was reduced by $1.438 million to account for the availability of prior year execution balances.			
Accomplishments/Planned Programs Subtotals	17.623	14.819	13.505

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605100D8Z / *Joint Mission Environment Test Capability (JMETC)*	Project (Number/Name) 088 / *JMETC National Cyber Range (NCR) Complex*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
088: *JMETC National Cyber Range (NCR) Complex*	151.248	70.153	64.227	57.905	-	57.905	-	-	-	-	-	-
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 67 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, cyber lethality, 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, capability assessments, cyberspace operations training, development and refinement of cyberspace tactics, techniques, and procedures (TTP), cyber 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 to include bi-lateral and multi-national exercises.

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 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 67 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

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0605100D8Z / *Joint Mission Environment Test Capability (JMETC)*	**Project (Number/Name)** 088 / *JMETC National Cyber Range (NCR) Complex*

particular cyber event requirements. The NCRC investments have been aligned to support the National Defense Strategy in improving cyber defense, cyber resilience, cyber lethality, 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, capability assessments, cyberspace operations training, development and refinement of cyberspace tactics, techniques, and procedures (TTP), cyber 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 to include bi-lateral and multi-national exercises.

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 with actionable information to decision makers. In addition, the NCRC workforce supports both the Executive Agent for Cyber Test Ranges and 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 2020	FY 2021	FY 2022
Title: JMETC National Cyber Range (NCR) Complex	70.153	64.227	57.905
Description: The NCRC continued support for over a hundred cyber events, providing cybersecurity T&E support to Major Defense Acquisition Programs (MDAP), Major Automated Information Systems (MAIS) Acquisition Programs, and smaller acquisition programs, as well as cybersecurity training to multiple COCOMS and Service organizations. 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. The NCRC continues to support Cyber Table Tops (CTT) which help acquisition programs identify and prioritize potential vulnerabilities for further assessment and mitigation early in the acquisition lifecycle.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0605100D8Z / *Joint Mission Environment Test Capability (JMETC)*	**Project (Number/Name)** 088 / *JMETC National Cyber Range (NCR) Complex*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
The NCRC continued support to Service Cyber Mission Forces (CMF) with training, certification, mission rehearsal and TTP development focused events. The NCRC continued support to numerous DoD organizations in cyber activities, including Director, Operational Test & Evaluation (DOT&E); Director, Developmental Test & Evaluation (DT&E); USCYBERCOM; USINDOPACOM; USCENTCOM; US SOCOM; Joint Staff J-7; US Space Force; Defense Intelligence Agency with a host of other intelligence agencies; Army Intelligence and Security Command; Naval Information Warfare Systems Command (NAVWARSYSCOM; Army Cyber Command; Army Cyber National Mission Forces/Cyber Protection Battalions; Naval Information Forces/Fleet Cyber; Naval Air Systems Command (NAVAIR); Naval Sea Systems Command (NAVSEA); Air Force Air Combat Command; Army Space and Missile Defense Command; Army Test and Evaluation Command; Army PEO Aviation; Army PEO Simulation Training and Instrumentation; Navy PEO for Enterprise Information Systems; Navy PEO for Command, Control, Communications, Computers and Intelligence; Navy PEO Ships; Naval Air Warfare Center Training Systems Division; Marine Corps Tactical Systems Support Activity; Naval Criminal Investigative Service; and several partner nations. The NCRC continued activities to establish four new government-controlled cyber range facilities, to include facility conversion work, procurement of computing resources, physical security accreditation, and development of training courseware for utilization of core NCRC cyber range tools by new NCRC workforce members. The NCRC continued activities to establish a multi-award IDIQ contract to expand the pool of NCRC contractor workforce members with a diverse set of required knowledge and skills to perform key functions at each NCRC location. The NCRC began implementation of an NCRC unclassified (NCRC-U) capability to provide increased access by government, academia, and industry to cyber range resources.			
FY 2021 Plans: The NCRC will continue to implement incremental improvements to the cyber range architecture and automated tools to increase efficiency in designing, deploying and sanitizing virtualized event environments. The NCRC will continue to build out additional dedicated Persistent Testing and Training Environments to support testing and training customers. The NCRC will continue to operate in support of the growing acquisition program cybersecurity T&E requirements. 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. 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. The NCRC will continue to support DOT&E cyber assessments. The NCRC will continue to support US Cyber Command and other COCOMS with their training, team certification and mission rehearsal activities. 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 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0605100D8Z / *Joint Mission Environment Test Capability (JMETC)*	**Project (Number/Name)** 088 / *JMETC National Cyber Range (NCR) Complex*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
The NCRC will continue activities to establish four new government-controlled cyber range facilities, to include facility conversion work, procurement and installation of computing resources, physical security accreditation, information system security accreditation, and development of training courseware for utilization of core NCRC cyber range tools by new NCRC workforce members. The NCRC will continue activities to make award of a multi-prime IDIQ contract to enable the government to fill key NCRC workforce member positions at each NCRC location. Complete initial implementation of NCRC-U to provide increased access by government, academia, and industry to cyber range resources. The NCRC will conduct engineering activities to plan for technical refresh of emerging end of life and end of service computing assets. 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. The NCRC will continue to assist the Executive Agents for Cyber Test Ranges and Cyber Training Ranges with identifying cyber range capability and distributed connectivity gaps as well as development of community standards to increase cyber range interoperability and virtual environment reuse. The NCRC will continue to expand the JMN connectivity as needed to provide access to cyber range resources. The NRCR will continue to develop and evolve cyber range capability to directly address United States Army Cyber Command rapid capability development, test and training needs.			
FY 2022 Plans: The NCRC will continue implementing improvements needed to increase capacity to support increased demand at the current and future cyber ranges. The NCRC will continue to build out additional dedicated Persistent Testing and Training Environments to support testing and training customers. The NCRC will continue to operate in support of the growing acquisition program cybersecurity T&E requirements. The NCRC will continue to provide Cyber Table Top support for acquisition programs to help identify and prioritize potential vulnerabilities early in the development lifecycle. 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. The NCRC will continue to support DOT&E cyber assessments. The NCRC will continue to support US Cyber Command and other COCOMS with their training, team certification and mission rehearsal activities. 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 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0605100D8Z / *Joint Mission Environment Test Capability (JMETC)*	**Project (Number/Name)** 088 / *JMETC National Cyber Range (NCR) Complex*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
The NCRC will conduct engineering activities to plan for technical refresh of emerging end of life and end of service computing assets. 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. The NCRC will continue to assist the Executive Agents for Cyber Test Ranges and Cyber Training Ranges to determine requirements and standards needed to integrate these cyber range facilities with existing acquisition system hardware-in-the-loop, software-in-the-loop, and systems integration laboratories to test systems and train operators in a realistic cyber contested environment. The NCRC will continue to expand the JMN connectivity as needed to provide access to cyber range resources. The NCRC will continue to initiate new cyber range capability and development to directly address United States Army Cyber Command test and training needs. The NCRC will continue activities to establish new government-controlled cyber range facilities, to include facility conversion work, procurement and installation of computing resources, physical security accreditation, and information system security accreditation. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The FY 2022 funding request was reduced by $6.100 million to account for the availability of prior year execution balances.			
Accomplishments/Planned Programs Subtotals	70.153	64.227	57.905

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

THIS PAGE INTENTIONALLY LEFT BLANK

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 0605104D8Z / *Technical Studies Support and Analysis*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	196.164	17.088	-	-	-	-	-	-	-	-	0.000	213.252
421: *Technical Studies*	196.164	17.088	-	-	-	-	-	-	-	-	0.000	213.252

Note

This program ended in FY 2021.

A. Mission Description and Budget Item Justification

This program is a key source of funding for the Office of the Secretary of Defense 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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	18.079	0.000	0.000	-	0.000
Current President's Budget	17.088	0.000	0.000	-	0.000
Total Adjustments	-0.991	0.000	0.000	-	0.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-0.991	-			
• SBIR/STTR Transfer	-	-			

Change Summary Explanation

Funding realigned for higher priorities.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605104D8Z / *Technical Studies Support and Analysis*	Project (Number/Name) 421 / *Technical Studies*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
421: *Technical Studies*	196.164	17.088	-	-	-	-	-	-	-	-	0.000	213.252
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 2020	FY 2021	FY 2022
Title: Technical Studies and Analyses Support for the Office of the Secretary of Defense (OSD)	17.088	0.000	-
FY 2021 Plans: No funding is requested for this program element in FY 2021.			
FY 2021 to FY 2022 Increase/Decrease Statement: 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	17.088	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 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 0605128D8Z / *Classified Program*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	873.709	104.000	110.000	0.000	-	0.000	-	-	-	-	-	-
128: *Classified Program*	873.709	104.000	110.000	0.000	-	0.000	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

N/A

A. Mission Description and Budget Item Justification

Classified

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	104.000	0.000	0.000	-	0.000
Current President's Budget	104.000	110.000	0.000	-	0.000
Total Adjustments	0.000	110.000	0.000	-	0.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	110.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2020	FY 2021
Project: 128: *Classified Program*		
Congressional Add: *Classified*	104.000	110.000
Congressional Add Subtotals for Project: 128	104.000	110.000
Congressional Add Totals for all Projects	104.000	110.000

Change Summary Explanation

N/A

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 0605128D8Z / *Classified Program*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021
Congressional Add: Classified	104.000	110.000
FY 2020 Accomplishments: Classified		
FY 2021 Plans: Classified		
Congressional Adds Subtotals	104.000	110.000

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 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 0605142D8Z / *Systems Engineering*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	257.275	35.860	45.626	40.030	-	40.030	-	-	-	-	-	-
142: *Systems Engineering*	255.275	33.860	39.226	16.985	-	16.985	-	-	-	-	-	-
842: *Mission Engineering*	2.000	2.000	4.400	13.096	-	13.096	-	-	-	-	-	-
144: *Program Engagement and Independent Assessments*	-	0.000	0.000	9.949	-	9.949	-	-	-	-	-	-
078: *Integration Technology and Tools*	0.000	0.000	2.000	0.000	-	0.000	-	-	-	-	-	-

Note

In FY 2022, funding is realigned from Project Code 142 (Systems Engineering) and Project Code 078 (Integration Technology and Tools) to create new Project Code 144 Program Technical Assessments and to fund emerging requirements within Project Code 842 Mission Engineering. These changes reflect the new organizational structure within the Deputy Director, Engineering: an increased focus on Mission Engineering activities (P842) as key enablers for technology development investment decisions and a refinement of focus that limits Program Technical Assessments (including Independent Technical Risk Assessments (ITRAs)) to Major Defense Acquisition Programs (MDAPs).

A. Mission Description and Budget Item Justification

This Program Element (PE) establishes the dedicated funding line to carry out the systems engineering and mission integration duties as described in DoDD 5137.02, “Under Secretary of Defense for Research and Engineering (USD(R&E)),” dated July 15, 2020. It also implements guidance and responsibilities as described in the FY 2017 National Defense Authorization Act (NDAA) Section 855 titled "Mission Integration Management (MIM)" and establishes Mission Engineering as the technical instantiation of MIM. Further, beginning in FY 2022, it includes efforts to implement the Software Science and Technology Strategy developed in response to the FY 2020 NDAA Section 255 titled “Department-wide Software Science and Technology Strategy” and other activities to lead improvement of software engineering across the Department. This strategy and the corresponding activities increase Joint Force readiness, resiliency, adaptability, and lethality by leading and facilitating near-term solutions to rapid technological advances and changes; and, leveraging existing commercial sector and Defense Industrial Base technology to the maximum extent possible.

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, and technology surprise opportunities to maintain tactical edge. Furthermore, it identifies opportunities to 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 modify existing systems. This program supports:

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 0605142D8Z / *Systems Engineering*

(1) Reforming the Department for greater performance and affordability by maintaining visibility into major programs and conducting independent technical risk assessments (ITRAs) or other program assessments to advise the Under Secretary of Defense for Research and Engineering (USD(R&E)) and Milestone Decision Authorities, and programs 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 (ME) analysis, development of technical mission and capability System of System (SoS) reference architecture (referred to as Government Reference Architectures), and establishment of a ME technical infrastructure and knowledge management system / data repository; and
(3) Cultivating 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.

In FY 2021, DoD Modeling and Simulation Coordination Office (MSCO) funding, Engineered 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 transferred from Development Test & Evaluation (PE 0605804D8Z) to Systems Engineering (PE 0605142D8Z).

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	37.140	49.376	42.699	-	42.699
Current President's Budget	35.860	45.626	40.030	-	40.030
Total Adjustments	-1.280	-3.750	-2.669	-	-2.669
• Congressional General Reductions	-	-3.750			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-1.274	-			
• Program Adjustments	-0.006	-	-2.669	-	-2.669

Change Summary Explanation

The FY 2022 funding request was reduced by $2.134 million to account for the availability of prior year execution balances and includes reduction for non-pay, non-fuel inflation.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605142D8Z / *Systems Engineering*	Project (Number/Name) 142 / *Systems Engineering*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
142: *Systems Engineering*	255.275	33.860	39.226	16.985	-	16.985	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Project Code 142 activities include the following functions:

• Support acceleration of USD(R&E)'s modernization initiatives and Principal Directors' Science and Technology (S&T) roadmap investments.

• 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.

• 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 and Technical Management (ETM) 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.

The following efforts are being re-aligned to Project Code 144, Development Test Evaluation and Assessments, starting in FY 2022:

• Provide Systems Engineering support to MDAPs. Review the systems engineering plans (SEPs) and activities for major defense acquisition programs (MDAPs).

• Monitor and advise Under Secretary of Defense (Research and Engineering) (USD(R&E)) and Under Secretary of Defense (Acquisition and Sustainment) (USD(A&S)) on technical and engineering aspects of MDAPs and select alternate acquisition 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.

• Conducts and approves independent technical risk assessments (ITRAs) on ACAT-1D MDAPs. Reviews and approves ITRAs on select high priority ACAT 1B/1C MDAPs.

• Conceive plans and conducts Preliminary and Critical Design Review Assessments of MDAPs under the Office of the Secretary of Defense (OSD) purview.

• Provides basis for critical technology and manufacturing process determinations and certifications of MDAPs under OSD purview in support of U.S.C. 10 Sec 2366 requirements.

• Provide risk assessments to support the development of cost, schedule, and performance targets required by U.S.C. 10 Sec 2448a.

• Support acceleration of USD(R&E)'s modernization initiatives in accordance with the National Defense Strategy.

• 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.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0605142D8Z / *Systems Engineering*	**Project (Number/Name)** 142 / *Systems Engineering*

• Oversee Service and other Component organizations' implementation of engineering initiatives and approve or conduct independent assessments.
• Guide Service and other component organizations in the development planning process to ensure proposed MDAP programs are executable within acceptable levels of risk.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Systems Engineering	33.860	30.226	15.985
FY 2021 Plans: Strategic Thrust: Program Support/Technical Risk Assessments (Re-aligned to Project Code 144 Program Engagement and Independent Assessments in FY 2022) • Enhance independent technical risk assessment. • Provide risk assessments to support cost, schedule, and performance targets required by U.S.C. 10 Sec 2448a. • Support acceleration of USD(R&E)'s modernization initiatives in accordance with the National Defense Strategy. • Provide engineers and technical leaders to develop and integrate technologies and modernization priorities. • Continued support to acquisition program managers in developing and documenting viable technical management approach. • Conduct technical reviews of acquisition to confirm program execution in accordance with systems engineering plans. • Provides Specialty Engineering support to ITRAs and other assessments. Strategic Thrust: Workforce Development • Streamline the current Engineering (ENG), Production, Quality, and Manufacturing (PQM), and Science & Technology (S&TM) career fields into a single Engineering and Technical Management (ETM) Career Field. • Serve as Functional Lead for ETM and Test and Evaluation (T&E) Career Fields. • Establish Competency Models for both the ETM and T&E Career Fields. • Establish Educational, Training, and experience requirements for T&E and ETM Career Fields that align with USD(A&S) Acquisition Workforce Transformation efforts. • Identify and establish requirements for Credentials in both the ETM and T&E Career Fields. • Provide leadership and advocacy for all Department non-construction engineering and quality assurance personnel. • Build an enduring high performance engineering/T&E culture across the Department. • Update and deploy courses with increased technical rigor and complex, case-based exercises. • Pursue workforce development initiatives including leadership development, specialized training, and improved instructional methods. • Assess ETM and T&E workforce capability and capacity, and, working with Services and other components organizations, develop strategies to address identified gaps. Strategic Thrust: Engineering Policy and Guidance • Develop and update core Engineering and T&E policy, guidance and standards; review all acquisition policy for Engineering and T&E implications.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0605142D8Z / *Systems Engineering*	**Project (Number/Name)** 142 / *Systems Engineering*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
• Develop Engineering and T&E guidance and policies for the acquisition process including requirements for use in alternate acquisition pathways. • Develop policy and guidance on inter-System of Systems (SoS) architecture analysis, system architecture verification, interoperability analysis, architecture development plans, and system of system (SoS)-level capability gaps. • Assess challenges and impacts and develop new guidance, best practices, methods, processes and tools to more effectively implement Engineering for product lines and system of systems (SoS). Strategic Thrust: Specialty Engineering/Software Engineering • Develop engineering guidance and policies for the integration of specialty engineering functions as part of the SE responsibility in the acquisition process including, but not limited to: manufacturing engineering; reliability and maintainability engineering; human systems integration; and value engineering. • Conduct software modernization studies and prototype activities to address challenges and opportunities and develop and promulgate best practices and guidance for applying software engineering principles, concepts, and practices in defense acquisition programs. • Conduct activities to develop and implement plans to enhance the specialty engineering and software engineering workforce. Strategic Thrust: Engineering Tools and Environments • Develop and sustain the Digital Engineering Community of Practice that concentrates on sharing best practices, developing solutions to common concerns, and establishing a body of knowledge repository that is flexible to serve varying uers' viewpoints across the DoD. • Apply digital engineering practices and body-of-knowledge information, 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. • Provide digital engineering implementation inputs to policy, guidance, and engineering workforce competency efforts. • Lead Digital Engineering infrastructure and application response efforts for the Department. Strategic Thrust: Connect the Engineering Community • Identify the current needs and specific implementations of engineering users of digital tools and environments, leading to unified effort to establish a connected engineering community, sharing tools, methods and data in order to provide engineering quality data to support decision makers. • Experiment with new computational capabilities (e.g. cloud) to discover the benefits and challenges for the engineering community. • Pilot development and use of a decision support environment and appropriate fidelity simulations for trade space analysis and performance determination.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0605142D8Z / *Systems Engineering*	**Project (Number/Name)** 142 / *Systems Engineering*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
• Establish an engineering user board to identify, assess, and transition worthwhile and evolving technologies (advanced process flow, physics-based simulations, etc.) as computational/digital methods for use in engineering activities. • Identify Knowledge Management techniques to provide systematic approaches for information and knowledge flow to and between the stakeholders at the right time for the right use. • Establish cooperative relationships with IT governing elements to evolve useful tools and methods; identify barriers to implementing engineering-needed solutions and identify gaps in IT solution space offerings. Strategic Thrust: Modeling and Simulation (M&S) • Transform the Defense Modeling and Simulation Coordination Office into the Model and Simulation Enterprise with a focus on reestablishing and leading the Defense Model and Simulation Enterprise Community of Practice (CoP) to increase the effective and efficient development and use of methods, processes, and tools for the model and simulation community. • Lead the development and collation of stakeholders' model and simulation challenges as the nexus for the community of practice and the resulting body of knowledge development to enable the Department's full spectrum of M&S activities. • Plan the transformation of the model and simulation suite of knowledge management tools to enable discoverability and reuse of joint and cross-cutting capabilities. • Re-focus model and simulation standards activities from process management to technical leadership and involvement, supporting the needs of stakeholders and future users, in model/simulation interoperability, model/simulation characterization and curation. • Evaluate model/simulation issuances for currency and suitability, and evolve the relevant model and simulation policies and guidance, using the community of practice challenges as a guide in prioritization. Assess the impacts of external policies and guidance on the model and simulation community, and vice versa.			
FY 2022 Plans: Strategic Thrust: Workforce Development • Streamline the current Engineering (ENG), Production, Quality, and Manufacturing (PQM), and Science & Technology (S&TM) career fields into a single Engineering and Technical Management (ETM) Career Field. • Serve as Functional Lead for ETM and Test and Evaluation (T&E) Career Fields. • Establish Competency Models for both the ETM and T&E Career Fields. • Establish Educational, Training, and experience requirements for T&E and ETM Career Fields that align with USD(A&S) Acquisition Workforce Transformation efforts. •Identify and establish requirements for Credentials in both the ETM and T&E Career Fields. • Provide leadership and advocacy for all Department non-construction engineering and quality assurance personnel. • Build an enduring high performance engineering/T&E culture across the Department. • Update and deploy courses with increased technical rigor and complex, case-based exercises.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0605142D8Z / *Systems Engineering*	**Project (Number/Name)** 142 / *Systems Engineering*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
• Pursue workforce development initiatives including leadership development, specialized training, and improved instructional methods. • Assess ETM and T&E workforce capability and capacity, and, working with Services and other components organizations, develop strategies to address identified gaps. Strategic Thrust: Engineering Policy and Guidance • Develop and update core Engineering and T&E policy, guidance and standards; review all acquisition policy for Engineering and T&E implications. • Develop Engineering and T&E guidance and policies for the acquisition process including requirements for use in alternate acquisition pathways. • Develop policy and guidance on inter-System of Systems (SoS) architecture analysis, system architecture verification, interoperability analysis, architecture development plans, and system of system (SoS)-level capability gaps. • Assess challenges and impacts and develop new guidance, best practices, methods, processes and tools to more effectively implement Engineering for product lines and system of systems (SoS). Strategic Thrust: Specialty Engineering/Software Engineering • Develop engineering guidance and policies for the integration of specialty engineering functions as part of the SE responsibility in the acquisition process including, but not limited to: manufacturing engineering; reliability and maintainability engineering; human systems integration; and value engineering. • 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. • Conduct activities to develop and implement plans to enhance the specialty engineering workforce. Strategic Thrust: Engineering Tools and Environments • Develop and sustain the Digital Engineering Community of Practice that concentrates on sharing best practices, developing solutions to common concerns, and establishing a body of knowledge repository that is flexible to serve varying uers' viewpoints across the DoD. • Apply digital engineering practices and body-of-knowledge information, 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. • Provide digital engineering implementation inputs to policy, guidance, and engineering workforce competency efforts. • Lead Digital Engineering infrastructure and application response efforts for the Department. Strategic Thrust: Connect the Engineering Community			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0605142D8Z / *Systems Engineering*	**Project (Number/Name)** 142 / *Systems Engineering*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
• Identify the current needs and specific implementations of engineering users of digital tools and environments, leading to unified effort to establish a connected engineering community, sharing tools, methods and data in order to provide engineering quality data to support decision makers. • Experiment with new computational capabilities (e.g. cloud) to discover the benefits and challenges for the engineering community. • Pilot development and use of a decision support environment and appropriate fidelity simulations for trade space analysis and performance determination. • Establish an engineering user board to identify, assess, and transition worthwhile and evolving technologies (advanced process flow, physics-based simulations, etc.) as computational/digital methods for use in engineering activities. • Identify Knowledge Management techniques to provide systematic approaches for information and knowledge flow to and between the stakeholders at the right time for the right use. • Establish cooperative relationships with IT governing elements to evolve useful tools and methods; identify barriers to implementing engineering-needed solutions; identify gaps in IT solution space offerings. Strategic Thrust: Modeling and Simulation (M&S) • Transform the Defense Modeling and Simulation Coordination Office into the Model and Simulation Enterprise with a focus on reestablishing and leading the Defense Model and Simulation Enterprise Community of Practice (CoP) to increase the effective and efficient development and use of methods, processes, and tools for the model and simulation community. • Lead the development and collation of stakeholders' model and simulation challenges as the nexus for the community of practice and the resulting body of knowledge development to enable the Department's full spectrum of M&S activities. • Plan the transformation of the model and simulation suite of knowledge management tools to enable discoverability and reuse of joint and cross-cutting capabilities. • Refocus model and simulation standards activities from process management to technical leadership and involvement, supporting the needs of stakeholders and future users, in model/simulation interoperability, model/simulation characterization and curation. • Evaluate model/simulation issuances for currency and suitability, and evolve the relevant model and simulation policies and guidance, using the community of practice challenges as a guide in prioritization. Assess the impacts of external policies and guidance on the model and simulation community, and vice versa. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Changes in funding level reflect re-alignment of efforts to new Project Code 144, Program Engagement and Independent Assessments and increased emphasis on Project Code 842 Mission Engineering.			
Title: Positioning, Navigation, and Timing (PNT) Open Architecture	-	9.000	1.000
Description: Build and validate common DoD open reference architecture standard for PNT systems:			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0605142D8Z / *Systems Engineering*	**Project (Number/Name)** 142 / *Systems Engineering*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
• Common messaging/interface standards increases PNT system and element interoperability across the services. • Open architecture reduces future PNT system development/integration costs. • Common reference architecture guides development of service and platform specific PNT solutions. • Streamline integration of new complementary sensor technology into existing and future DoD systems. ***FY 2021 Plans:*** Continue initial development of a modular open system architecture for positioning, navigation, and timing (PNT) systems. Continue development of PNT interface standards based on previous work from the DARPA All-Source Positioning and Navigation (ASPN) program. ***FY 2022 Plans:*** Continue development of a modular open system architecture for positioning, navigation, and timing (PNT) systems. Continue development of PNT interface standards based on previous work from the DARPA All-Source Positioning and Navigation (ASPN) program. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The decrease is attributable to the completion of the bulk of the efforts in the Positioning, Navigation and Timing Open Architecture task.			
Accomplishments/Planned Programs Subtotals	33.860	39.226	16.985

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605142D8Z / *Systems Engineering*	Project (Number/Name) 842 / *Mission Engineering*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
842: *Mission Engineering*	2.000	2.000	4.400	13.096	-	13.096	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Program Element (PE)/Project Code (Pcode) establishes a dedicated funding line to support the technical activities to carry out responsibilities described in the FY 2017 National Defense Authorization Act (NDAA) Section 855 titled Mission Integration Management (MIM) and supports the National Defense Strategy goals of developing new joint warfighting concepts and modernization of emerging capabilities to achieve a more lethal force.

In FY 2022, USD(R&E) will achieve full operational capability of the mission engineering framework that is being built in FY 2021 to instantiate the technical element of MIM and identify and promulgate best practices for mission-focused analyses and studies. This is to ensure the DoD applies engineering rigor to both operational and technical analysis of future capabilities to enable DoD leaders to make informed investment decisions and deliver technologies and capabilities to close mission gaps in response to new threats. Using this guidance, the USD(R&E) staff will execute multiple mission engineering studies in support of the National Defense Strategy modernization areas to identify technology solutions, advise on development of requirements, and develop Government Reference Architectures (GRA) for new joint warfighting capabilities. GRAs are a key enterprise document that will be used to guide and constrain development of capabilities that are required for warfighters to carry out operational and tactical missions against our adversaries.

USD(R&E) staff, in coordination with the Joint Staff, OSD/CAPE, USD/A&S, Combatant Commands, Services, and other stakeholders, will provide engineering analysis and studies at the campaign, mission, and engagement levels to support the prioritization and development of the Department's technology modernization and prototyping roadmaps. USD(R&E) will also continue to develop the technical infrastructure and analysis tools for engineering studies and data mining as well as modeling and simulation analytic tools to support this effort.

This effort also supports the analysis of "as is" operational and technical architectures of current joint capabilities and further support the development of "to be" GRAs of future required capabilities to align investment opportunities with emerging technological developments. It will also create opportunities to maintain a tactical edge by enabling innovative and timely application of new warfighting concepts, insertion of advanced capabilities on shorter timelines, improving interoperability, and formulating long-term strategies to retain or improve our technical overmatch against our adversaries.

Project Code 842 supports the following activities:
- Develop GRAs; establish enduring mission engineering analytic capability; instantiate a digital ecosystem to share knowledge amongst MIM / ME stakeholders.
- Participate in mission engineering activities by providing functional and program specific engineering expertise to support joint mission level analysis.
- Integrates models with advanced analytic and computational tools to enable rapid design and analysis of current and future weapon systems.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Mission Integration	2.000	4.400	13.096

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0605142D8Z / *Systems Engineering*	**Project (Number/Name)** 842 / *Mission Engineering*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
FY 2021 Plans: • Establish initial operational capability and baseline for Mission Engineering (ME) as the technical component of Mission Integration Management (MIM). • Provide functional and program specific mission engineering expertise to support joint mission level analysis in the areas of hypersonics, directed energy, cyber, electromagnetic spectrum, joint Command and Control (C2), NC3, PNT, and others as directed by USD(R&E). • Perform engineering studies to establish metrics, resource estimates, and program impacts to inform Program Objective Memorandum; Planning, Programming, Budgeting, and Execution, and other financial management analyses such as the Strategic Portfolio Reviews conducted by OSD/CAPE. • Perform high-level executable system of system architecture trades and analyses for product line and technology to address mission capability gaps. • Support the development of the Joint All Domain Command & Control (JADC2) and the Fully Networked Command, Control, and Communications (FNC3) GRAs. • Continue to develop and instantiate the technical and digital infrastructure to perform mission engineering analysis, promote sharing of data, curation of models, hosting of analytic tools, and execution of simulations. • Identify a repeatable process and tool to establish data relationships to enable discovery, standardization, and usability of the data across DoD for mission engineering analyses. • Support for Nuclear Command, Control, and Communications (NC3) governance; conduct NC3 mission engineering studies to support development of GRAs and provide recommendations for research and development efforts; and support the development of the NC3 Modernization Alignment White Paper and Annual R&D Plan. • Ensure USD(R&E) participation in the Joint Capabilities Integration and Development System (JCIDS) and Joint Force Integration Cell (JFIC)efforts to support development and maturation of new joint warfighting concepts; and enhance capability integration and development of systems requirements. • Support: (1) Services and COCOMs in pre-Milestone (MS) A formulation; (2) requirements analyses and analysis of alternatives; (3) development of architectures to guide prototyping and experimentation roadmaps; and (4) inform initial capabilities document definition and development.			
FY 2022 Plans: • Fully implement the ME analytical framework as the technical component of MIM and expand its use across government and industry. • Provide functional and program specific mission engineering expertise to support joint mission level analysis in the areas of contested logistics, hypersonics, electromagnetic spectrum, joint C2, NC3, directed energy, autonomy, missile defense, and others as directed. • Perform high-level executable system of system architecture trades and analyses for product line and technology to address mission capability gap derived from new joint warfighting concepts, strategic portfolio reviews, and national defense guidance.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0605142D8Z / *Systems Engineering*	**Project (Number/Name)** 842 / *Mission Engineering*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
• Develop and update government reference architectures for selected programs within the USD(R&E) modernization areas, in particular Future Networked C3 (FNC3), directed energy, hypersonics, and cyber. • Maintain the architecture guidance and the publication of a Mission Engineering Guide and support associated training material across DoD and industry partners. • Expand mission engineering support for up to six high priority mission sets as determined by USD(R&E) and support decisions for identification of joint mission-based prototyping projects. • Develop methods for governing changes and managing technical data for GRAs. Develop and conduct training in use of reference architectures. • Perform architecture tradeoff analyses to enable effective mission engineering and manage integration of emerging technologies with systems in development and / or in operation. Leverage this information to assist USD(A&S) with its Capability Portfolio Management process to ensure current systems maintain relevancy in the future warfare environment. • Perform architecture assessments to verify compliance of major systems interfaces through use of standards. Provide recommendations to improve joint and allied interoperability. • Execute system architecture verification, interoperability analysis, architecture development plans, and system of system (SoS)-level capability gaps analysis. • Instantiate a knowledge management system and continue to develop the technical infrastructure to perform mission engineering analysis, promote sharing of data, curation of models, hosting of analytic tools, and execution of simulations. • Further mature and maintain processes and tools required to establish data relationships to enable discovery, standardization, and usability of the mission engineering data across DoD. • Continue the support for NC3 governance activities; conduct NC3 mission engineering studies to support development of GRAs and provide recommendations for research and development efforts; and support the development of the NC3 Modernization Alignment White Paper and Annual R&D Plan. • Expand USD(R&E) participation in the Joint Capabilities Integration and Development System (JCIDS) and Joint Force Integration Cell (JFIC) efforts to support development and maturation of new joint warfighting concepts; enhance capability and development of systems requirements through mission engineering insights. • Support: (1) Services and COCOMs in pre-MS A formulation; (2) requirements analyses and analysis of alternatives; (3) architectures to guide development of prototyping and experimentation roadmaps; and (4) inform initial capabilities document definition and development. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Change in funding level is due to a re-alignment and expansion of efforts in this Program Element (PE), to fully implement and accurately reflect Mission Integration Management and Mission Engineering activities as directed by law.			
Accomplishments/Planned Programs Subtotals	2.000	4.400	13.096

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0605142D8Z / *Systems Engineering*	**Project (Number/Name)** 842 / *Mission Engineering*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605142D8Z / *Systems Engineering*	Project (Number/Name) 144 / *Program Engagement and Independent Assessments*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
144: *Program Engagement and Independent Assessments*	-	0.000	0.000	9.949	-	9.949	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

New Project Code created, in FY 2022, to accurately reflect requirements supported by Development Test Evaluation and Assessment activities.

A. Mission Description and Budget Item Justification

Development Test Evaluation and Assessment activities include the following functions:
• Provide Systems Engineering support to MDAPs. Review the systems engineering plans (SEPs) and activities for major defense acquisition programs (MDAPs).
• Monitor and advise USD(R&E) and USD(A&S) on technical and engineering aspects of MDAPs and select alternate acquisition 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 risk assessments of MDAP under OSD purview and other select alternate acquisition programs to ensure program success. Conducts or approves ITRAs on MDAPs.
• Conceive plans and conducts Preliminary and Critical Design Review Assessments of MDAP under OSD purview.
• Provides basis for critical technology and manufacturing process determinations and certifications of MDAP under OSD purview in support of U.S.C. 10 Sec 2366 requirements.
• Provide risk assessments to support the development of cost, schedule, and performance targets required by U.S.C. 10 Sec 2448a.
• Support acceleration of USD(R&E)'s modernization initiatives in accordance with the National Defense Strategy.
• 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.
• Oversee Service and other Component organizations implementation of engineering initiatives and approve or conduct independent assessments.
• Guide Service and other component organizations in the development planning process to ensure proposed MDAP programs are executable within acceptable levels of risk.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Development Test Evaluation and Assessments	-	-	9.949
FY 2022 Plans: Strategic Thrust: Program Support/Technical Risk Assessments • Enhance and continue to conduct or approve independent technical risk assessments of MDAPs.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0605142D8Z / *Systems Engineering*	**Project (Number/Name)** 144 / *Program Engagement and Independent Assessments*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
• Monitor and advise USD(R&E) and USD(A&S) on technical and engineering aspects of MDAPS and select alternate acquisition pathway programs. • Conceive plans and conducts Preliminary and Critical Design Review Assessments of MDAP under OSD purview. • Provide basis for critical technology and manufacturing process determinations and certifications of MDAP under OSD purview in support of U.S.C. 10 Sec 2366 requirements. • Provide risk assessments to support cost, schedule, and performance targets required by U.S.C. 10 Sec 2448a. • Support acceleration of USD(R&E)'s modernization initiatives in accordance with the National Defense Strategy. • Provide engineers and technical leaders to develop and integrate technologies and modernization priorities. • Continued support to acquisition program managers in developing and documenting viable technical management approach. • Conduct technical reviews of acquisition to confirm program execution in accordance with systems engineering plans. • Provides Specialty Engineering support to ITRAs and other assessments. • Perform early acquisition risk assessment including pre-MS A engagement with Joint Requirements Oversight Council processes. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** New Project Code (Pcode) 144 created to accurately capture Development, Test, Evaluation and Assessments activities.			
Accomplishments/Planned Programs Subtotals	-	-	9.949

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605142D8Z / *Systems Engineering*	Project (Number/Name) 078 / *Integration Technology and Tools*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
078: *Integration Technology and Tools*	0.000	0.000	2.000	0.000	-	0.000	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In FY 2022, funding from this Project Code is re-aligned within this Program Element for other mission priorities.

A. Mission Description and Budget Item Justification

Project Code 078 supports the National Defense Strategy goals of developing a more lethal force by instituting enterprise-wide research, methods, practices and tools to: improve systems engineering practices; support 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 2020	FY 2021	FY 2022
Title: Integration Technology and Tools	-	2.000	0.000
FY 2021 Plans: Strategic Thrust: Modular Open Systems Approach • Develop and sustain modular open systems approaches (MOSA) across the Department through policy, guidance, standards, and major program support. • Develop comprehensive engineering methods for development and use of modular and open architectures to support integration of emerging technologies. • Develop and use a common semantic framework to enable modular open architectures and cross-domain tool interoperability, compatibility and re-use. • 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. • Provide Methods, Processes, and Tools to manage MOSA Business Practices for Intellectual Property and Technology Data Management; provide the ability for competition of replacement elements, when properly supported by appropriate data rights/ intellectual property access. • Develop MOSA common descriptions/definitions, contract language, cybersecurity in MOSA systems, implementation guidance, and standards. Strategic Thrust: Systems Engineering Research Center (SERC)			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0605142D8Z / *Systems Engineering*	**Project (Number/Name)** 078 / *Integration Technology and Tools*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
• Sustain capabilities that support innovation and the use of critical technology for emergent and evolving mission objectives. ***FY 2022 Plans:*** Strategic Thrust: Modular Open Systems Approach • Continue the development and sustainment of modular open systems approaches (MOSA) across the Department through policy, guidance, standards, and major program support. • Support comprehensive engineering methods for development and use of modular and open architectures to support integration of emerging technologies. • Support and use a common semantic framework to enable modular open architectures and cross-domain tool interoperability, compatibility and re-use. • Provide expertise in MOSA Technical Evaluations that assesses an acquisition technical approach for modular design practices. • Provide expertise in Methods, Processes, and Tools to manage MOSA Business Practices for Intellectual Property and Technology Data Management. • Continue to refine and develop MOSA common descriptions/definitions, contract language, cybersecurity in MOSA systems, implementation guidance, and standards. Strategic Thrust: Systems Engineering Research Center (SERC) • Sustain capabilities that support innovation and the use of critical technology for emergent and evolving mission objectives. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Changes reflect minor budget fluctuations.			
Accomplishments/Planned Programs Subtotals	-	2.000	0.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

THIS PAGE INTENTIONALLY LEFT BLANK

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 0605151D8Z / *Studies and Analysis Support – OSD*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	28.175	4.611	5.777	4.612	-	4.612	-	-	-	-	-	-
151: *Studies and Analysis Support – OSD*	28.175	4.611	5.777	4.612	-	4.612	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

The OUSD(P&R)'s Studies and Analysis Support program 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.

Funding is leveraged to address key, strategic, and long-term challenges facing the Department, and include targeted assessments to support program evaluation and efficacy. It also encompasses 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. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	4.759	5.777	5.163	-	5.163
Current President's Budget	4.611	5.777	4.612	-	4.612
Total Adjustments	-0.148	0.000	-0.551	-	-0.551
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Program Adjustment	-0.148	-	-0.551	-	-0.551

Change Summary Explanation

The FY 2022 funding request was reduced by $0.490 million to account for the availability of prior year execution balances.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605151D8Z / *Studies and Analysis Support – OSD*	Project (Number/Name) 151 / *Studies and Analysis Support – OSD*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
151: *Studies and Analysis Support – OSD*	28.175	4.611	5.777	4.612	-	4.612	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The OUSD(P&R) Studies and Analysis Support program 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 line supports independent, intellectually rigorous, relevant, impartial, objective, 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 in executing the National Defense Strategy and the Secretary of Defense's "Taking Care of Our People" priority, ensuring a proactive and forward leaning posture, focusing on a strategic programmatic and policy framework for the future of the Department's force development, resiliency, and readiness. Funding is leveraged to address key, strategic, and long-term challenges facing the Department, and include targeted assessments to support program evaluation and efficacy. It also encompasses comprehensive research and complex exploration to support data driven decision-making and critical analysis to develop needed evidentiary bases for policy development or modification in support of Administration priorities, Congressional direction, and Secretary of Defense direction.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Studies and Analysis Support – OSD	4.611	5.777	4.612

Description: P&R's Studies and Analysis program is focused on efforts that align with the National Defense Strategy and our vision of a strategically ready, globally relevant, and flexibly sustainable Total Force enabled by digital modernization for data dominance. Resources fund Federally Funded Research and Development Centers (FFRDCs), University Affiliated Research Centers (UARCs), and other contracts for studies, analysis, research, and surveys that address the strategic challenges facing P&R and the Department of Defense, reflect enterprise-wide equities, focus on strategic programmatic and policy frameworks, and demonstrate how we cannot accomplish internally or through other means.

FY 2021 Plans:

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.

- Assessing national trends with respect to the population
- Conducting assessments of workplace climates and program strategies
- Understanding best practices for employee engagement/relevancy

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0605151D8Z / *Studies and Analysis Support – OSD*	**Project (Number/Name)** 151 / *Studies and Analysis Support – OSD*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
• Addressing force structure, capability and readiness in evolving warfighter domains • Understanding the future of dependent care in the DoD; modernizing our training infrastructure for the future fight • Adapting the recruiting/retention environment for the modern force • Challenging cultural norms of force mix • Adapting DoD mindset for societal/economic population changes • Understanding future force requirements for urbanization and population shifts • Understanding technological impacts on health care delivery. ***FY 2022 Plans:*** Specific endeavors are anticipated to focus on: • Assessing national trends with respect to the population and the implications for the recruitment, retention, sustainment, and viability of the All-Volunteer Force; • Enhancing the resiliency and readiness of the Total Force by fostering diversity and inclusiveness, and countering extremism; • Encouraging innovative solutions to an ever-increasing range of challenges including traditional adversaries and climate change; • Defeating COVID-19 by working closely with our Federal Government partners; • Adapting to changing national societal/economic/political/demographic changes and needs with respect to the delivery of health care and family program/benefits understanding the future of dependent care in the DoD; modernizing our training infrastructure for the future fight.fight. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The FY 2022 funding request was reduced to account for the availability of prior year execution balances.			
Accomplishments/Planned Programs Subtotals	4.611	5.777	4.612

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

THIS PAGE INTENTIONALLY LEFT BLANK

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 0605161D8Z / *Nuclear Matters*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	37.295	7.803	16.542	14.429	-	14.429	-	-	-	-	-	-
161: *Nuclear Matters*	37.295	7.803	16.542	14.429	-	14.429	-	-	-	-	-	-

Note

Program addresses nuclear modernization and sustainment of the nuclear stockpile using modeling and analysis to make data-driven decisions.

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 Department of Defense (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 series of efforts to provide data-driven 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 NWC and similar bodies seek 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 conduct a variety of assessment and study efforts to support 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.

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),

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 0605161D8Z / *Nuclear Matters*

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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	8.307	16.552	16.901	-	16.901
Current President's Budget	7.803	16.542	14.429	-	14.429
Total Adjustments	-0.504	-0.010	-2.472	-	-2.472
• Congressional General Reductions	-	-0.010			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Program Adjustment	-0.504	-	-2.472	-	-2.472

Change Summary Explanation

The adjustment from FY 2021 to FY 2022 internally realigns funds within the department for National Defense Strategy priorities and to address other program adjustments.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605161D8Z / *Nuclear Matters*	Project (Number/Name) 161 / *Nuclear Matters*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
161: *Nuclear Matters*	37.295	7.803	16.542	14.429	-	14.429	-	-	-	-	-	-
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, test and evaluation efforts, as well as, studies and analyses for nuclear weapons security; use control; nuclear weapons stockpile safety, survivability and performance; nuclear forensics; 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 2020	FY 2021	FY 2022
Title: Nuclear Weapons Council (NWC)	0.475	0.475	0.768
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 2021 Plans: - 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			
FY 2022 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0605161D8Z / *Nuclear Matters*	**Project (Number/Name)** 161 / *Nuclear Matters*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
- 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 ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The FY 2021 to FY 2022 increase is the result of planned internal program adjustments.			
Title: International Programs ***Description:*** The United States 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. ***FY 2021 Plans:*** - Leverage confidence building programs of cooperation with international partners through tri and bi-lateral annual, semi-annual, and monthly engagements under Mutual Defense Agreements. - Sponsor international partners at national-level nuclear weapons accident/incident exercises, workshops, render safe exercises through tri-lateral engagements under Mutual Defense Agreements. ***FY 2022 Plans:*** - Continue confidence building programs of cooperation with international partners through tri and bi-lateral annual, bi-annual, semi-annual, and monthly engagements under Mutual Defense Agreements. - 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. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The FY 2021 to FY 2022 increase is the result of planned internal program adjustments.	0.200	0.200	0.250
Title: Nuclear Surety ***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. ***FY 2021 Plans:*** - 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	0.745	0.745	0.852

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0605161D8Z / *Nuclear Matters*	**Project (Number/Name)** 161 / *Nuclear Matters*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
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. - 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. ***FY 2022 Plans:*** - 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. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The FY 2021 to FY 2022 increase is the result of planned internal program adjustments.			
Title: Stockpile Transformation	2.622	3.052	3.000
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 enterprise 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. ***FY 2021 Plans:*** - 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. - Manage DoD RDT&E activities for nuclear warheads to include B61, W76, W78, W80, B83, W87, W88 Weapons. - Support studies for warhead replacement. ***FY 2022 Plans:***			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0605161D8Z / *Nuclear Matters*	**Project (Number/Name)** 161 / *Nuclear Matters*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
- 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. - Continue to manage DoD RDT&E activities for nuclear warheads to include B61, W76, W78, W80, B83, W87, W88 Weapons. - Continue to support studies for warhead replacement. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The FY 2021 to FY 2022 decrease is the result of planned internal program adjustments.			
Title: Nuclear Matters Support ***Description:*** Support to Nuclear Matters includes the following: - Managing the operational, technical, and administrative support for the NWC and its subordinate bodies for a Safe, Secure, Effective, and Credible Nuclear Deterrent. - 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. - Developing technical content for briefings, reports, and decision letters; guides documents through coordination; and resolves issues within and between the agencies. - Maintaining official records of NWC and subordinate body proceedings and other official documents. - Address Original Classification Authority requirements for Formally Restricted Data - Reviewing and documenting Freedom of Information Act and Mandatory Declassification Requests (Annual average of over 500 nuclear-related requests). ***FY 2021 Plans:*** - Submit annual reports to the President and the Congress. - Oversee DoD/DOE relationship regarding the survivability and surety of the national nuclear stockpile. - Serve as DoD Sigma 15 Approval Authority (Interface with DOE/NNSA). - Address Original Classification Authority requirements for Formally Restricted Data - Address Freedom of Information Act and Mandatory Declassification Requests. ***FY 2022 Plans:*** - Continue to submit annual reports to the President and the Congress. - Continue to oversee DoD/DOE relationship regarding the survivability and surety of the national nuclear stockpile. - Continue as DoD Sigma 15 Approval Authority (Interface with DOE/NNSA). - Continue to address Original Classification Authority requirements for Formally Restricted Data	0.675	0.676	0.865

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0605161D8Z / *Nuclear Matters*	**Project (Number/Name)** 161 / *Nuclear Matters*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
- Continue to address Freedom of Information Act and Mandatory Declassification Requests. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The FY 2021 to FY 2022 increase is the result of planned internal program adjustments.			
Title: Physical Security and PPBE Support	0.875	2.983	3.013
Description: This support addresses program management, evaluation, and resourcing functions associated with the Physical Security Enterprise & Analysis Group (PSEAG), the Security Policy Verification Committee, and National Technical Nuclear Forensics 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. ***FY 2021 Plans:*** - 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. - 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. - 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. - 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. ***FY 2022 Plans:*** Continue to support the following: - 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. - 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. - 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			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0605161D8Z / *Nuclear Matters*	**Project (Number/Name)** 161 / *Nuclear Matters*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
of government and commercial off-the-shelf (GOTS/COTS) products, ensuring systems integration, and promoting interoperability and sustainability. - 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. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The FY 2021 to FY 2022 increase is the result normal contract escalation.			
Title: Nuclear Deterrent Enterprise Review Group (NDERG) ***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 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. 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. ***FY 2021 Plans:*** - Allow the Nuclear Community to gain immediate access to data, reducing build costs, development risks, and timeline to begin creating insights from Nuclear Enterprise data. - 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. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** NDERG activities will fall under the purview of the NWC starting in FY 2022.	0.750	0.750	-
Title: Nuclear Incident Response and North Atlantic Treaty Organization (NATO)	0.750	0.750	0.750

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0605161D8Z / *Nuclear Matters*	**Project (Number/Name)** 161 / *Nuclear Matters*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
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. 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. ***FY 2021 Plans:*** - 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. - Coordinate overseas nuclear weapon storage and deployment issues with the Department of State, Combatant Commands, Services, and other DoD organizations. - Employ 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. ***FY 2022 Plans:*** - 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. - Continue to coordinate overseas nuclear weapon storage and deployment issues with the Department of State, Combatant Commands, Services, and other DoD organizations. - 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. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** No change.			
Title: Nuclear Deterrent Model	-	4.200	4.931
Description: In order to overcome evolving threats to the U.S. nuclear deterrent, the NWC must understand the trade space, benefits, challenges, and increases or decreases in effectiveness related to decisions regarding nuclear warheads and their associated delivery systems and platforms. Nuclear Matters is leading a series of efforts to provide data-driven decision making support to NWC decision makers with threat-informed choices regarding U.S. nuclear deterrent modernization and sustainment. ***FY 2021 Plans:***			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0605161D8Z / *Nuclear Matters*	**Project (Number/Name)** 161 / *Nuclear Matters*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
- 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 trade offs. - 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. ***FY 2022 Plans:*** - Leverage 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 trade offs. - 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. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The FY 2021 to FY 2022 increase is the result of planned internal program adjustments.			
Title: Nuclear Modernization ***Description:*** Data driven decision making for nuclear modernization leveraging Federally Funded Research and Development Centers and University Affiliated Research Centers ***FY 2021 Plans:*** - Leverage the nuclear physical security expertise at the University of Texas Applied Research Laboratory to address nuclear security operations and MITRE to address interoperability requirements for the nuclear and non-nuclear physical security communities. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Data analysis requirements driven by need.	0.711	2.711	-
Accomplishments/Planned Programs Subtotals	7.803	16.542	14.429

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 0605170D8Z / *Support to Networks and Information Integration (NII)*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	82.059	7.295	9.582	4.759	-	4.759	11.085	10.282	8.854	9.027	Continuing	Continuing
170: *Support to NII*	82.059	7.295	9.582	4.759	-	4.759	11.085	10.282	8.854	9.027	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Support to Networks and Information Integration (NII) program supports Global Positioning System (GPS) User Equipment Synchronization with GPS space and operational control segments to conduct DoD CIO oversight of GPS management and planning activities required for meeting JCIDs requirements. The NII program also supports policy and guidance for incorporation of alternative means of PNT delivery to augment GPS. In additions, the program 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 U.S. 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 which are utilized by the Joint Force and key U.S. 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 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 0605170D8Z / *Support to Networks and Information Integration (NII)*

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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	9.441	9.582	8.983	-	8.983
Current President's Budget	7.295	9.582	4.759	-	4.759
Total Adjustments	-2.146	0.000	-4.224	-	-4.224
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-1.796	-			
• SBIR/STTR Transfer	-0.350	-			
• Program Adjustment	-	-	-4.224	-	-4.224

Change Summary Explanation

The FY 2022 funding request was reduced by $4.012 million to account for the availability of prior year execution balances.

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Support to Networks and Information Integration (NII)	7.295	9.582	4.759
FY 2021 Plans: Global Positioning System (GPS) User Equipment Synchronization with GPS space and control segments to conduct DoD CIO oversight of GPS management and planning activities required for meeting JCIDs requirements and supporting the National Space-Based Positioning, Navigation and Timing Executive Committee will support: - Manage the GPS Security Policy (DoDM-O4650.11). - Manage the Information Assurance/COMSEC elements of DoDM-O4650.11. - Develop Precise Time and Time Interval (PTTI) Manual in DoDD 4650.05 family of PNT Issuances. - 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. - Manage PNT Navigation Warfare Instruction and Annexes to all the Operations Plans (OPLANS) and Contingency Plans (CONPLANS) in coordination with US STRATCOM.			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 0605170D8Z / *Support to Networks and Information Integration (NII)*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
- Manage NextGen interfaces with the GPS Wing, Joint Program Development Office (JPDO), and Air Force. Continue implementation of Red Key Sundown Policy. - 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. - Perform annual update of National Five-year Plan for Space-Based Positioning, Navigation and Timing (PNT). - 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. - 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. - Implement additional Instructions (DoDIs) for public affairs and receiver certification, and DoDM for security policy. - Manage inventory of DoD GPS receivers. Complete Roadmap of GPS UE fielding for MGUE. - 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. - 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. - Develop Directives, Instructions, and Manuals for implementation of the PNT Strategy within the Department. - Continue special task directed by DCIO to address acceleration of development and fielding of advanced GPS receivers in the Joint Force. - 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. - Address prioritized platforms in fielding plans and guidance to Services. - Develop MGUE “Roadmap” illustrating necessary fielding milestones for Joint Force MGUE equipage. - 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. - 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. - Insure cyber security of all elements of the Department PNT ecosystem. Assist civil Departments and Agencies, as required. Integrated Planning and Management (NMO):			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 0605170D8Z *I Support to Networks and Information Integration (NII)*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
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. 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. 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.			
FY 2022 Plans: Global Positioning System (GPS) User Equipment Synchronization with GPS space and control segments to conduct DoD CIO oversight of GPS management and planning activities required for meeting JCIDs requirements and supporting the National Space-Based Positioning, Navigation and Timing Executive Committee will support: - Manage the GPS Security Policy (DoDM-O4650.11). - Manage the Information Assurance/COMSEC elements of DoDM-O4650.11. - Develop Precise Time and Time Interval (PTTI) Manual in DoDD 4650.05 family of PNT Issuances. - 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. - Manage PNT Navigation Warfare Instruction and Annexes to all the Operations Plans (OPLANS) and Contingency Plans (CONPLANS) in coordination with US STRATCOM. - Manage NextGen interfaces with the GPS Wing, Joint Program Development Office (JPDO), and Air Force. Continue implementation of Red Key Sundown Policy. - 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. - Perform annual update of National Five-year Plan for Space-Based Positioning, Navigation and Timing (PNT).			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 0605170D8Z / *Support to Networks and Information Integration (NII)*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
- 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. - 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. - Implement additional Instructions (DoDIs) for public affairs and receiver certification, and DoDM for security policy. - Manage inventory of DoD GPS receivers. Complete Roadmap of GPS UE fielding for MGUE. - 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. - 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. - Develop Directives, Instructions, and Manuals for implementation of the PNT Strategy within the Department. - Continue special task directed by DCIO to address acceleration of development and fielding of advanced GPS receivers in the Joint Force. - 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. - Address prioritized platforms in fielding plans and guidance to Services. - Develop MGUE “Roadmap” illustrating necessary fielding milestones for Joint Force MGUE equipage. - 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. - 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. - Insure cyber security of all elements of the Department PNT ecosystem. Assist civil Departments and Agencies, as required. Integrated Planning and Management (NMO): 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.			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 0605170D8Z / *Support to Networks and Information Integration (NII)*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
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. 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. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The FY 2022 funding request was reduced by $4.012 million to account for the availability of prior year execution balances.			
Accomplishments/Planned Programs Subtotals	7.295	9.582	4.759

D. Other Program Funding Summary ($ in Millions)

N/A

Remarks

E. Acquisition Strategy

N/A

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 0605200D8Z / *General Support to OUSD(I)*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	8.200	20.196	7.904	1.952	-	1.952	-	-	-	-	-	-
200: *General Spt to USDI*	8.200	20.196	7.904	1.952	-	1.952	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

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 classified ISR operational capabilities that directly support NDS priorities. In addition, senior level education is provided for better understanding to make informed decisions on ISR operations related initiatives, platforms, sensors and force structure.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	20.200	1.940	2.230	-	2.230
Current President's Budget	20.196	7.904	1.952	-	1.952
Total Adjustments	-0.004	5.964	-0.278	-	-0.278
• Congressional General Reductions	-	-0.036			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	6.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Program Adjustment	-0.004	-	-0.278	-	-0.278

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2020	FY 2021
Project: 200: *General Spt to USDI*		
Congressional Add: *Program Increase - Applied Research Laboratory for Intelligence and Security*	-	6.000
Congressional Add Subtotals for Project: 200	-	6.000
Congressional Add Totals for all Projects	-	6.000

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 0605200D8Z *I General Support to OUSD(I)*

Change Summary Explanation

Increase in FY 2021 due to a congressional add.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605200D8Z / *General Support to OUSD(I)*	Project (Number/Name) 200 / *General Spt to USDI*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
200: *General Spt to USDI*	8.200	20.196	7.904	1.952	-	1.952	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

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 classified ISR operational capabilities that directly support NDS priorities. In addition, senior level education is provided for better understanding to make informed decisions on ISR operations related initiatives, platforms, sensors and force structure.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: General Spt to USDI	20.196	1.904	1.952
Description: 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 classified ISR operational capabilities that directly support NDS priorities. In addition, senior level education is provided for better understanding to make informed decisions on ISR operations related initiatives, platforms, sensors and force structure.			
FY 2021 Plans: Security Activities provides technology development and concept evaluation for applications in support of OUSD(I&S). ISR Ops provides expert engineering and technical assessments on a wide range of ISR operational issues. Funds also support senior level education and understanding to inform decisions on ISR operations related initiatives, platforms, sensors and force structure.			
FY 2022 Plans: Security Activities will continue to provide technology development and concept evaluation for applications in support of OUSD(I&S).			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0605200D8Z / *General Support to OUS D(I)*	**Project (Number/Name)** 200 / *General Spt to USDI*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
ISR Ops will continue to provide expert engineering and technical assessments on a wide range of classified ISR operational capabilities that directly support NDS priorities. Funds will support senior level education and understanding to inform decisions on ISR operations related initiatives, platforms, sensors and force structure. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Increase in FY 2021 due to a congressional add.			
Accomplishments/Planned Programs Subtotals	20.196	1.904	1.952

	FY 2020	FY 2021
Congressional Add: Program Increase - Applied Research Laboratory for Intelligence and Security	-	6.000
FY 2021 Plans: Initiate development of innovative technologies and solutions to enhance Federal Vetting Enterprise and protection of critical technologies. This will be done in conjunction with interagency partners leveraging University Affiliated Research Center (UARC).		
Congressional Adds Subtotals	-	6.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 0605502D8Z *I Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR)*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	122.216	133.393	0.000	0.000	-	0.000	-	-	-	-	-	-
502: *SBIR*	122.216	133.393	0.000	0.000	-	0.000	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

DoD SBIR/STTR programs are designed to provide small, high-tech businesses opportunities to propose innovative ideas and solutions in response to technological challenges posed by the DoD Components that will address existing and emerging national security threats and to develop new military capabilities. 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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	0.000	0.000	-	0.000
Current President's Budget	133.393	0.000	0.000	-	0.000
Total Adjustments	133.393	0.000	0.000	-	0.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	133.393	-			

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 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605502D8Z / *Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR)*	Project (Number/Name) 502 / *SBIR*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
502: *SBIR*	122.216	133.393	0.000	0.000	-	0.000	-	-	-	-	-	-
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 2020	FY 2021	FY 2022
Title: SBIR	114.731	-	-
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. 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: • 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; • Strategic Capabilities: Hypersonic Electro-Optical Seeker; High Acceleration and Hypervelocity Inertial Measurement Unit; High-Resolution/High-Sensitivity Video Seeker; • 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 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0605502D8Z / *Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR)*	**Project (Number/Name)** 502 / *SBIR*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
• Missile Defense: Ballistic Missile Defense System-Level Simulation Optimization; Distributed Real-Time Information Assurance Management Technologies; Divert and Attitude Control Systems; Debris Modelling; • 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; • 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; • 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 • Geospatial Intelligence: Machine Learning to Suppress False Alarms in Automated Target Recognizers; Automated Assessment of Urban Environment Degradation for Disaster Relief and Reconstruction. Emerging Results from SBIR Investments in FY 2019 include: • DLA COVID-19: Pulsed Plasma Treatment for Rapid In-Between-Patient Disinfection of Non-Invasive Ventilation Systems and Personal Protection Equipment After COVID-19 Use; • DARPA: U.S.-based Secure Embedded L4 Microkernel (seL4) Center of Excellence; Design Tools for Hardware Trojan Detection and Mitigation • U.S. Special Operations Command (SOCOM): Indirect Fire Aiming Device; Handheld or Body-worn Hidden Chamber Detection; Radio Frequency(RF) Optical Front-End Receiver; Spectrum Aware Wideband Interference Rejector; • NGA: Adversarially-learned Labels using Activity and Reward Models; Object Counting using Unified Latent Representation; • SCO: High Velocity Gun-Launched Projectile and Sabot Structures; and • OSD: High Energy Density Spirally Wound Silicon Anode Lithium-ion (Li-ion) Batteries; Spirally-Wound Silicon Anode Cells for • Enabling Longer Mission Runtime. 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: • Artificial Intelligence: Improve algorithms, address data quality, optimize human-machine coordination and disrupt adversaries' efforts; • Autonomy: Address teaming of autonomous systems; machine perception, reasoning and intelligence; human and autonomy systems trust and interaction; • Communications: Addressing high-performance, low power embedded processing and developing algorithms for self-configuring, self-healing and resource allocation; • Cyber: Address behavioral issues, develop self-securing networks and develop methodologies to assess cyber effects and consequences;			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0605502D8Z / *Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR)*	**Project (Number/Name)** 502 / *SBIR*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
• Directed Energy: Address power scaling, jitter reduction, laser size and weight, adaptive optics, beam propagation and target tracking; • Hypersonics: Address high temperature materials, hypersonic vehicle manufacturing, air breathing propulsion and hypersonic guidance and control systems; • Microelectronics: Develop domestic capabilities through small business investments; • 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 • Space: Developing Low Earth Orbit nano-satellites for missile warning, intelligence, surveillance, reconnaissance, navigation and communications.			
Title: STTR ***Description:*** The set-aside program that funds cooperative R/R&D projects for small businesses in partnership with research institutions. 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: •Special Operations: Situational Awareness; •Chemical/Biological Defense: Mitigation of Radiation Effects; Electromagnetic Pulse and High Power Microwave Protection Systems; • Defense Advanced Research Projects: Radio Frequency Emitter-Localization for Complex Environments; Portable Lasers; Visual Recognition System; • Additive Manufacturing: Low Cost Phased Array Manufactured by 3D Printing; and • Geospatial Intelligence: Algorithms for Look-down Infrared Target Exploitation. Emerging results from the nine STTR projects are unavailable due to project immaturity. 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: • Artificial Intelligence: Improve algorithms, address data quality, optimize human-machine coordination and disrupt adversaries' efforts; • Autonomy: Address teaming of autonomous systems; machine perception, reasoning and intelligence; human and autonomy systems trust and interaction; • Communications: Addressing high-performance, low power embedded processing and developing algorithms for self-configuring, self-healing and resource allocation;	17.422	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0605502D8Z / *Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR)*	**Project (Number/Name)** 502 / *SBIR*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
• Cyber: Address behavioral issues, develop self-securing networks and develop methodologies to assess cyber effects and consequences; • Directed Energy: Address power scaling, jitter reduction, laser size and weight, adaptive optics, beam propagation and target tracking; • Hypersonics: Address high temperature materials, hypersonic vehicle manufacturing, air breathing propulsion and hypersonic guidance and control systems; • Microelectronics: Develop domestic capabilities through small business investments; • 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 • Space: Developing Low Earth Orbit nano-satellites for missile warning, intelligence, surveillance, reconnaissance, navigation and communications.			
Title: Commercialization Readiness Program ***Description:*** Under the authority defined in 15 U.S.C. 638 (y), Commercialization Readiness Program (CRP), OSD established the "OSD Transitions SBIR/STTR Technology (OTST) Program". The OTST Program is a dynamic, results-oriented response to the Congressional challenge to the DoD in 2006 to deliver more advanced SBIR/STTR technologies faster to our warfighters. The OTST program is an interim technology maturity phase (Phase II) inserted into the SBIR/STTR development process and is structured to be a Technology Pull to meet requirements that address potential and emerging requirements.	1.240	-	-
Accomplishments/Planned Programs Subtotals	133.393	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

THIS PAGE INTENTIONALLY LEFT BLANK

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 0605790D8Z *I Small Business Innovation Research (SBIR)/Small Business Technolog y Transfer (STTR)*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	-	3.567	3.582	3.639	-	3.639	-	-	-	-	-	-
518: *SBIR/Challenge Admin*	-	3.567	3.582	3.639	-	3.639	-	-	-	-	-	-

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 authority to establish SBIR and STTR programs is codified in 15 U.S.C. 638. The statutory goals of the programs are to stimulate technological innovation, meet federal research and development (R&D) needs, foster and encourage participation in innovation and entrepreneurship by women and socially or economically disadvantaged persons, and increase private sector commercialization of innovations from federal R&D funding. In addition, the STTR program aims to foster technology transfer through cooperative R&D between small businesses and research institutions.

The DoD SBIR/STTR programs set-aside almost two billion dollars annually Defense-wide to competitively fund scientific and technical innovation to specifically address the National Defense Strategy (NDS) modernization priorities and the mission needs of participating DoD components. DoD components participating in the SBIR/ STTR programs include: 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), Defense Logistics Agency (DLA), Defense Microelectronics Activity (DMEA), Defense Health Agency (DHA), Strategic Capabilities Office (SCO), Defense Human Resources Activity (DHRA), Space Development Agency (SDA), and the Office of Secretary of Defense (OSD).

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	3.568	3.582	3.639	-	3.639
Current President's Budget	3.567	3.582	3.639	-	3.639
Total Adjustments	-0.001	0.000	0.000	-	0.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Program Adjustments	-0.001	-	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605790D8Z / *Small Business Innovation Research (SBIR)/Small Business Technology Transfer (STTR)*	Project (Number/Name) 518 / *SBIR/Challenge Admin*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
518: *SBIR/Challenge Admin*	-	3.567	3.582	3.639	-	3.639	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Small Business Innovation Research (SBIR) program and the Small Business Technology Transfer (STTR) programs are highly competitive programs that encourage domestic small businesses to engage in federal research, development, test and evaluation (RDT&E) with the potential for commercialization. Through a competitive awards-based program, SBIR/STTR enables small businesses to explore their technological potential and provide the incentive to profit from its commercialization. By including qualified small businesses in the nation's research and development (R&D) arena, high-tech innovation is stimulated, and the United States gains entrepreneurial spirit as it meets specific research and development needs.

The SBIR/STTR programs are 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 programs. 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 programs are expected to obtain funding from the private sector and/or non-SBIR/non-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, oversight of program execution for participating DoD agencies, outreach to small businesses, Impact Level IV (IL4) environment hosting/operation and maintenance for the Defense SBIR/STTR Innovation Portal (DSIP), and conduct of a virtual symposium to better communicate DoD mission and technology needs to small businesses.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: SBIR/Challenge Admin	3.567	3.582	3.639
Description: This program element is the only source of funds for the coordination, administration and execution of the Department's SBIR/STTR programs in accordance with statute, SBA SBIR/STTR Policy Directive, and DoD policies and regulations. The Director, Small Business and Technology Partnerships (SBTP) is tasked with oversight and execution of essential SBIR/STTR Program activities that are required by law.			
FY 2021 Plans: (1) Coordinate and execute the administrative portions of the DoD SBIR/STTR Programs including the development of technical topics, preparation of SBIR/STTR Broad Agency Announcements (BAAs) or Commercial Solution Offerings (CSOs), and receipt of proposal responses; execute the OSD SBIR/STTR budgets and ensure alignment with NDS modernization priorities;			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0605790D8Z / *Small Business Innovation Research (SBIR)/Small Business Technology Transfer (STTR)*	**Project (Number/Name)** 518 / *SBIR/Challenge Admin*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
(2) Establish automated processes across the entire SBIR/STTR lifecycle including the development and maintenance of the Defense SBIR/STTR Innovation Portal (DSIP) and software required for the measurement, evaluation, and effective management of the Department's SBIR/STTR Programs; (3) Establish an outreach program that includes participation in local, state, regional, and national conferences, SBA Road Tours, and other outreach events, geared toward 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. Conduct a virtual SBIR/STTR symposium that educates the SBIR/STTR community on the NDS modernization priorities, and select topics that will increase small business understanding of engaging with DoD, protecting intellectual property/data rights, and critical technology protection; (4) Coordinate oversight, collect results, track execution and provide reporting of Phase II technology transition in the DoD SBIR Commercialization Readiness Program (CRP); and (5) Prepare all reports mandated by law and policy. ***FY 2022 Plans:*** (1) Continue coordination and execution of the administrative responsibilities of the DoD SBIR/STTR programs; (2) Refine and improve established automated processes across the entire SBIR/STTR lifecycle; (3) Re-evaluate and expand upon existing outreach programs; (4) Continue oversight, collection of results, tracking execution and reporting of Phase II technology transition results from the DoD SBIR Commercialization Readiness Program (CRP); and (5) Prepare and respond to required reports mandated by law and policy. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The increase reflects minor budget adjustments.			
Accomplishments/Planned Programs Subtotals	3.567	3.582	3.639

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

THIS PAGE INTENTIONALLY LEFT BLANK

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 0605797D8Z / *Maintaining Technology Advantage*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	0.000	20.244	25.561	25.889	-	25.889	-	-	-	-	-	-
138: *S&T Protection*	0.000	9.230	8.340	6.363	-	6.363	-	-	-	-	-	-
139: *Joint Acquisition Protection Exploitation Cell (JAPEC)*	0.000	5.379	6.157	6.532	-	6.532	-	-	-	-	-	-
158: *Program and Technology Protection*	0.000	5.635	5.354	6.039	-	6.039	-	-	-	-	-	-
043: *Technology Innovation Base*	0.000	0.000	5.710	6.955	-	6.955	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

This Program Element provides funding to support efforts to maintain the Department of Defense's (DoD)'s technology advantage. Maturing and implementing the Office of the Under Secretary of Defense (Research and Engineering)'s (OUSD(R&E)) technology priorities requires a healthy and capable National Security Innovation Base (NSIB). Additionally, the targeting of U.S. capabilities by our strategic competitors creates the potential to degrade core U.S. military technological advantages through unwanted technology transfer from the innovation base. The technology transfer, including 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 plan to maintain DoD's technology advantage.

(1) DoD is promoting strategic technology investments to promote and protect DoD access to new and innovative technology. These investments provide OUSD(R&E)'s ability to determine strategies for future investments to establish and maintain a robust academic and industrial base capable of creating breakthroughs in key areas of basic research, fostering transition and decreasing time to market, and harvesting technologies within the U.S. innovation ecosystem or with likeminded allies.

(2) 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.

(3) DoD must combat adversaries' attempts to thwart the U.S. NSIB and associated 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 protection activities across the science and technology (S&T) enterprise and programs to address the threat over the long term. S&T protection focuses on ensuring the integrity of the research enterprise through development of policy and conducting adequate due diligence on researchers. 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, software assurance 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,

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 0605797D8Z / *Maintaining Technology Advantage*

enhance the use of software assurance capability, improve integration of cybersecurity into the engineering processes, mature processes to identify Critical Program Information integration of defense exportability features, expand software assurance capabilities provided by the Joint Federated Assurance Center (JFAC), established in National Defense Authorization Act (NDAA) Sec 937, and improve program protection planning. FY 2021 and FY 2022 program growth adds the Technology Innovation Base (TIB) effort to develop near- and long-term strategies and employs mechanisms to retain the U.S. advantage in current and emerging modernization technology priorities by addressing the capabilities of the innovation base to develop, test, manufacture, and sustain them. This project provides support to technology priority leaders in identifying innovation base needs; characterizing and assessing priority technology investments, identifying and mitigating issues and risks impacting the innovation base, and exploiting opportunities to advance technology development, testing, and manufacturing.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	20.936	29.566	29.149	-	29.149
Current President's Budget	20.244	25.561	25.889	-	25.889
Total Adjustments	-0.692	-4.005	-3.260	-	-3.260
• Congressional General Reductions	-	-4.005			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.688	-			
• Cancelled Account Reduction	-0.004	-	-	-	-
• Program Adjustments	-	-	-3.260	-	-3.260

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2020	FY 2021
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

The FY 2022 funding request was reduced by $1.352 million to account for the availability of prior year execution balances.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605797D8Z / *Maintaining Technology Advantage*	Project (Number/Name) 138 / *S&T Protection*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
138: *S&T Protection*	0.000	9.230	8.340	6.363	-	6.363	-	-	-	-	-	-
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 integrated with technology promotion activities. 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 science and technology (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 2020	FY 2021	FY 2022
Title: Science and Technology (S&T) Protection	6.230	8.340	6.363
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 2021 Plans: The program will continue efforts to address S&T protection activities: - Establish/oversee S&T protection policy guidance. - Produce, deploy and maintain TAPPs for each modernization initiative/critical technology area. - Develop S&T protection curriculum to S&T/Acq program and Protection (IC/CI/Security) work force. - Engage Universities, University Affiliated Research Centers (UARCs), DoD Laboratories and develop/deploy tailored S&T protection practices and lessons learned. - Develop models of the research community to analyze implications of policy on U.S. S&T enterprise.			
FY 2022 Plans: The program will continue efforts to address S&T protection activities: - Oversee S&T protection policy guidance and track implementation. - Develop modules to promote DoD research.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0605797D8Z / *Maintaining Technology Advantage*	**Project (Number/Name)** 138 / *S&T Protection*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
- Oversee TAPPs for each modernization initiative/critical technology area. - Deliver/deploy S&T protection curriculum to S&T/Acquisition program and Protection (IC/CI/Security) work force. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The decrease in funding from FY 2021 to FY 2022 significantly impacts the ability to: (1) create new Technology Area Protection Plans (TAPPs) for any newly identified modernization initiatives; and (2) continually enhance existing TAPPs to track progress in the respective areas.			
Accomplishments/Planned Programs Subtotals	6.230	8.340	6.363

	FY 2020	FY 2021
Congressional Add: Securing American Science and Technology	3.000	-
FY 2020 Accomplishments: In FY 2020, initiated a contract with the National Academy to establish a roundtable in order to meet the objectives of the FY 2020 congressional add. This is an ongoing four-year effort. The Roundtable is a standing body which provides a venue to address the mutual concerns of the national security, law enforcement, and academic research communities. The Roundtable will: 1) Explore critical issues related to protecting U.S. national and economic security; 2) Identify and consider security threats and risks associated with federally funded research and development; 3) Identify effective approaches to communicating threats and risks; 4) Share best practices for addressing and mitigating the threats and risks; and 5) Examine potential near- and long-terms responses by stakeholders in the research enterprise to mitigate and address the risks associated with foreign threats. Proceedings of the Roundtable discussions will be produced, as well as an overarching summary, at the end of four years.		
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 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605797D8Z / *Maintaining Technology Advantage*	Project (Number/Name) 139 / *Joint Acquisition Protection Exploitation Cell (JAPEC)*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
139: *Joint Acquisition Protection Exploitation Cell (JAPEC)*	0.000	5.379	6.157	6.532	-	6.532	-	-	-	-	-	-
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, intelligence, counterintelligence, and law enforcement sources, to determine consequences and appropriate preventative/mitigation actions against unwanted technology transfer. 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 to support and promote activities. 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 2020	FY 2021	FY 2022
Title: Joint Acquisition Protection Exploitation Cell (JAPEC)	5.379	6.157	6.532
Description: Integrate controlled unclassified information, to include Controlled Technical Information (CTI) protection efforts across DoD to proactively mitigate losses resulting from unwanted technology transfer and exploit opportunities to deter, deny, and disrupt adversaries that may threaten U.S. military advantage.			
FY 2021 Plans: - Partner and develop international (bilateral/multilateral) protection practices integrated with promotion activities with select allies. - Develop and coordinate operationalization of critical program and technology enhanced protection. - Integrate with national efforts (e.g., National Cyber Incident Joint Task Force (NCIJTF)/National Counterintelligence Task Force (NCITF)/MDCO/national law enforcement to provide targeted engagements. - Develop and implement consistent protection activities. - Scale specialized protection activities to counter strategic competitor illicit transfer of technology.			
FY 2022 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0605797D8Z / *Maintaining Technology Advantage*	**Project (Number/Name)** 139 / *Joint Acquisition Protection Exploitation Cell (JAPEC)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
The program will continue efforts to counter strategic competitor technology transfer activities: - Continued partnering and development of international (bilateral/multilateral) protection practices with select allies. - Integrate counter activities to support promote and protect efforts. - Continued development and operationalization of critical program and technology enhanced protection. - Continue to integrate with national CI and LE efforts to counter unwanted strategic competitor activities. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The FY 2022 funds reflect a realignment to support other priority areas.			
Accomplishments/Planned Programs Subtotals	5.379	6.157	6.532

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605797D8Z / *Maintaining Technology Advantage*	Project (Number/Name) 158 / *Program and Technology Protection*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
158: *Program and Technology Protection*	0.000	5.635	5.354	6.039	-	6.039	-	-	-	-	-	-
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 Department of Defense (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. Activities carried out include supporting implementation of DoDI 5000.83, Technology and Program Protection to Maintain Technological Advantage. 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, mature processes to integrate defense exportability features, 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 2020	FY 2021	FY 2022
Title: Program and Technology Protection	5.635	5.354	6.039
Description: This project provides system security engineering policy, guidance and technical implementation assessments to inform and reduce risks in sharing and storing Controlled Technical Information and data, 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 engineering implementation of DoD instruction 5000.83, Technology and Program Protection to Maintain Technological Advantage; 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			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0605797D8Z / *Maintaining Technology Advantage*	**Project (Number/Name)** 158 / *Program and Technology Protection*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
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 2021 Plans:*** Provide support to Independent Technical Review Assessment and Cyber Vulnerability Review Assessment teams in conduct of broad program protection planning activities to assess: - Conduct of criticality analyses to determine capability, systems and technology vulnerabilities. - Conduct of Critical Program Information analysis to determine capability, systems and technology anti-tamper protections. - Conduct Program Protection planning activities, and track progress to verify protection of capability, systems and technologies. • Advance the state of the practice of systems security engineering: - Continue development of methodology to identify and mitigate system security risk, to include cybersecurity and supply chain risk. - Continue to develop courseware, refine guidance, provide training, and outreach with government and industry. - Refine guidance, tools and mitigation approaches to mitigate capability, system and technology risks. • Safeguard Controlled Unclassified Information, including Controlled Technical Information: - Refine implementation and guidance of marking and dissemination of distribution of technical information. - Refine safeguarding information protection methods for contractor unclassified information networks. • Safeguard Critical Program Information: - Refine implementation, guidance and tools to identify Critical Program Information. - Develop and refine Anti-Tamper protections methods to safeguard Critical Program Information. • Defense exportability features integration: - Mature processes, methods and guidance for defense exportability features integration. - Develop and refine defense exportability protection methods to improve planning for the exportability of U.S. Defense systems. ***FY 2022 Plans:*** Continue to: • Provide support to Independent Technical Review Assessment and Cyber Vulnerability Review Assessment teams in conduct of broad program protection planning activities to assess: - Conduct of criticality analyses. - Conduct of Critical Program Information analysis to determine anti-tamper protections. - Conduct of Program Protection planning activities, and track progress to protections of capability, systems and technologies. • Advance the state of the practice of systems security engineering: - Continue development of methodologies to identify and mitigate system security risk, to include cybersecurity and supply chain risk.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0605797D8Z / *Maintaining Technology Advantage*	**Project (Number/Name)** 158 / *Program and Technology Protection*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
- Continue to develop courseware, refine guidance, provide training, and outreach with government and industry. - continue to refine guidance, tools and mitigation approaches to mitigate capability, system and technology risks. • Safeguard Controlled Unclassified Information, including Controlled Technical Information: - Continue to refine implementation and guidance of marking and dissemination of distribution of technical information. - continue to refine safeguarding information protection methods for contractor unclassified information networks. • Safeguard Critical Program Information: - Continue to refine implementation, guidance and tools to identify Critical Program Information. - Continue to refine Anti-Tamper protections methods to safeguard Critical Program Information. • Defense exportability features integration: - Continue to mature processes, methods and guidance for defense exportability features integration. - Continue to develop and refine defense exportability protection methods to improve planning for the exportability of U.S. Defense systems. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Changes reflect minor budget fluctuations.			
Accomplishments/Planned Programs Subtotals	5.635	5.354	6.039

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605797D8Z / *Maintaining Technology Advantage*	Project (Number/Name) 043 / *Technology Innovation Base*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
043: *Technology Innovation Base*	0.000	0.000	5.710	6.955	-	6.955	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Technology Innovation Base (TIB) effort develops near- and long-term strategies and employs mechanisms to retain the U.S. advantage in current and emerging modernization technology priorities by addressing the capabilities of the innovation base to develop, test, manufacture, and sustain them. This project provides support to technology priority leaders in identifying innovation base needs; characterizing and assessing priority technology investments, identifying and mitigating issues and 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 FY 2019 National Defense Authorization Act (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 needs 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 generate innovation-base inputs to technology roadmaps, develop an investment plan addressing the needs of the innovation base, and 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 investments and strategies. For technology protection, TIB manages the Office of the Under Secretary of Defense (Research and Engineering) (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 OUSD(R&E) equities and request subject matter experts review in foreign acquisition transactions with a potential negative impact to national security. TIB is the focal point for OUSD(R&E) export control activities. TIB manages the activities necessary to provide technical advice to the Defense Technology Security Administration regarding export control regulations and license review policy. This includes prioritization of critical technologies for inclusion in the Commerce Control List and the U.S. Munitions List and the processing of export license applications involving emergent technologies.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Technology Innovation Base	-	5.710	6.955
FY 2021 Plans: • 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. • Assess, promote, protect, and monitor critical technologies and their supply chain.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0605797D8Z / *Maintaining Technology Advantage*	**Project (Number/Name)** 043 / *Technology Innovation Base*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
• 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. • Conduct deep dive assessments to identify and address innovation base risks, issues, and opportunities for 5G, Autonomy, Hypersonics, and Workforce to include but not limited to: - Tools, technologies or techniques associated with development, testing, or manufacturing - Financial health of key industrial partners and suppliers - Workforce need for scientists, engineers, technicians - 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 • Manage research and engineering (R&E) Committee on Foreign Investment in U.S. transaction and export control licenses reviews. • Monitor the defense innovation base and the performance of the protect/promote activities.			
FY 2022 Plans: • 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. • Industry outreach – including industry days and workshops to define requirements to advance emergent technologies through open-market models and industry-government collaboration. • Manufacturing challenges to find solutions to facilitate tech transfer from the labs to the production lines, improve manufacturing process, take advantage of new capabilities related to additive manufacturing and/or the integration of new materials. • Assess market trends and execute financial analysis to determine opportunities for US industry – competition, collaboration with allies, reduction of foreign dependencies. • Assess, promote, protect, and monitor critical technologies and their supply chain. • 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. • Conduct deep dive assessments to identify and address national security innovation base risks, issues, and opportunities related to DoD to include but not limited to: - Tools, technologies or techniques associated with development, testing, or manufacturing - Financial health of key industrial partners and suppliers - Workforce need for scientists, engineers, technicians - 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 • Create Technology/Innovation Base Protection strategies for each technology priority area; including management of R&E Committee on Foreign Investment in U.S. transaction, export control assessments, and intellectual property.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0605797D8Z / *Maintaining Technology Advantage*	**Project (Number/Name)** 043 / *Technology Innovation Base*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
• Monitor the defense innovation base and the performance of the protect/promote activities. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increase reflects DoD sustainment assessment funding level to identify and address new, emerging manufacturing capabilities and technology base gaps that are critical to fielding modernization priorities and other US technological advantage areas, including workforce, engineering and prototyping infrastructure and facilities. It also reflects the commitment to balance protection and promotion to advance the emergent technologies and develop a healthy innovation base; including the implementation of a protection strategy that considers critical elements like CFIUS, export controls, and intellectual property.			
Accomplishments/Planned Programs Subtotals	-	5.710	6.955

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 0605798D8Z / *Defense Technology Analysis*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	-	15.334	23.341	39.774	-	39.774	-	-	-	-	-	-
796: *Laboratory Resource Management*	-	8.136	5.355	18.248	-	18.248	-	-	-	-	-	-
797: *Defense Technology Analysis*	-	4.715	5.282	10.717	-	10.717	-	-	-	-	-	-
798: *Defense Support Teams*	-	2.483	9.204	8.369	-	8.369	-	-	-	-	-	-
728: *Homeland Defense Capability Development*	-	0.000	3.500	2.440	-	2.440	-	-	-	-	-	-

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.

The PE funds research and technical analysis and management, under the direction of the 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.

This PE also funds Homeland Defense Capabilities Development Initiatives to address technology application in support of homeland defense of our military installations and the surrounding areas.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 0605798D8Z / *Defense Technology Analysis*

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	15.875	29.059	28.185	-	28.185
Current President's Budget	15.334	23.341	39.774	-	39.774
Total Adjustments	-0.541	-5.718	11.589	-	11.589
• Congressional General Reductions	-	-5.718			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.538	-			
• Cancelled Account	-0.003	-	-	-	-
• Program Adjustments	-	-	11.589	-	11.589

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2020	FY 2021
Project: 796: *Laboratory Resource Management*		
Congressional Add: *Program Increase - Defense Technology Transfer*	3.000	0.000
Congressional Add Subtotals for Project: 796	3.000	0.000
Congressional Add Totals for all Projects	3.000	0.000

Change Summary Explanation

The FY 2022 funding increase to support LabCon / Defense Laboratory Enhancement Fund.
The FY 2022 funding request was reduced by $2.065 million to account for the availability of prior year execution balances.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605798D8Z / *Defense Technology Analysis*	Project (Number/Name) 796 / *Laboratory Resource Management*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
796: *Laboratory Resource Management*	-	8.136	5.355	18.248	-	18.248	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

FY 2021 $3.000 million congressional add funding will be realigned to Project Code 796 within the Program Element for execution to meet congressional intent.

A. Mission Description and Budget Item Justification

The Laboratories & Personnel Office (L&PO) provides advocacy, strategic planning, and policy for the DoD's 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. L&PO develops proposals 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 Under Secretary of Defense for Research and Engineering (USD(R&E)). Section 218 of the FY 2018 NDAA amended the authority by re-designating management to the Under Secretary of Defense for Research and Engineering (USD(R&E)).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Laboratories and Personnel Office	5.136	5.355	3.248
Description: Provides advocacy, strategic planning, and policy for the DoD's laboratories. Develops proposals and investment strategies for laboratory infrastructure, technology transfer programs, and personnel development. ***FY 2021 Plans:*** • The L&PO 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 support the Defense Laboratory Enterprise. • The L&PO will establish a T2 professional development program, pilot a common T2 intellectual property docketing and agreement management system, and train for partnership intermediaries and technology transition. • The L&PO will continue to identify best practices and business models to refine policy as well as share across the DoD enterprise through the DoD Partnership Intermediary Agreement study. ***FY 2022 Plans:*** • The L&PO 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 support the Defense Laboratory Enterprise.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0605798D8Z / *Defense Technology Analysis*	**Project (Number/Name)** 796 / *Laboratory Resource Management*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
• From the completed Partnership Intermediary Agreement study identify best practices and value/impact to laboratory and/or service mission, and understand the various business models implemented across the DoD T2 community. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Decrease in funding is due to re-alignment of funds for higher priority DoD missions.			
Title: Central Lab Investment Program (CLIP) ***Description:*** This effort seeks to address infrastructure gaps within the Department's Laboratory community by establishing a dedicated funding stream for laboratory components to address the laboratory infrastructure issues, including facility planning, design, construction, sustainment repair and/or modernization. In addition, CLIP could be used to acquire advanced equipment and tools, enabling the labs to devote their RDT&E funding to critical R&D and offset their sustainment, repair and modernization (SRM) funding gap. ***FY 2022 Plans:*** The L&PO will establish and execute policy and a program to solicit and select laboratory infrastructure and equipment projects executable within a year of award. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The FY 2022 funds represent a new start for this program. The DoD Laboratories have annually presented an unfunded MilCon request to Congress and this fund will begin to address the challenges that the Service laboratories face in their attempts to fund laboratory and equipment capability improvements.	-	-	15.000
Accomplishments/Planned Programs Subtotals	5.136	5.355	18.248

	FY 2020	FY 2021
Congressional Add: Program Increase - Defense Technology Transfer	3.000	0.000
FY 2020 Accomplishments: - Funding was sent to AFRL to support MilTech technology transition program, which has assisted DoD laboratories and programs as follows: - Assisted private sector partners who have licensed DoD laboratory innovation to take products to market and/or to the US warfighter. - Supported DoD programs' requirements generation and product designs to reduce development time and product costs. - Continued maturing technology scouting processes and virtual platform.		
FY 2021 Plans: - Funding will be sent to AFRL to support MilTech technology transition program, which will: - Provide technology transition expert support to DoD labs and Programs.		

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0605798D8Z / *Defense Technology Analysis*	**Project (Number/Name)** 796 / *Laboratory Resource Management*

	FY 2020	FY 2021
- Develop and provide technology transition training to DoD T2 professionals. - Identify and share best practices of DoD technology transition activities and programs.		
Congressional Adds Subtotals	3.000	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 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605798D8Z / *Defense Technology Analysis*	Project (Number/Name) 797 / *Defense Technology Analysis*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
797: *Defense Technology Analysis*	-	4.715	5.282	10.717	-	10.717	-	-	-	-	-	-
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 (DDRE(M)) starting in FY 2021. The DDRE(M) 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 directly support and are critical to developing and continuously updating research and technology development roadmaps as required by FY21 NDAA section 217.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Defense Technology Analysis	4.715	5.282	10.717
Description: The DDRE(M) is responsible for developing the Department's roadmap efforts in the eleven modernization priorities areas: 5G; Artificial Intelligence; Autonomy; Biotechnology; Cyber; Directed Energy; Fully Networked Command, Control, and Communication; Hypersonics; Microelectronics; Quantum Science; and Space. Identification of leading edge technology is critical in delivering capability to the warfighter and maintaining the competitive advantage. Funding for research, technical analysis and management, and other advanced research methods will allow for success in identifying game changing technology investments for the Department's modernization efforts.			
FY 2021 Plans: Conduct analysis and research studies to support updates and advancement of modernization roadmaps to reflect emerging trends in the modernization field and enable the transition of capabilities from basic and applied research to prototypes and demonstrations. Continue analysis in defense modernization efforts while coordinating with Service leads to identify Military Department capability needs aligned with Joint Warfighting Concepts.			
FY 2022 Plans: Leverage strategic partnerships to ensure the Department's investments are appropriately focused on the modernization priorities and address issues to close remaining investment gaps. While continuing to conduct analysis and research studies to support updates and advancements of modernization roadmaps to reflect emerging trends ensuring the Department's competitiveness.			
FY 2021 to FY 2022 Increase/Decrease Statement:			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0605798D8Z / *Defense Technology Analysis*	**Project (Number/Name)** 797 / *Defense Technology Analysis*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
The increase from FY 2021 to FY 2022 provides critical funding needed to conduct crucial research studies in direct support of the advancement of modernization roadmaps and adds significant risk to ensuring the Department's competitiveness now and in the future.			
Accomplishments/Planned Programs Subtotals	4.715	5.282	10.717

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605798D8Z / *Defense Technology Analysis*	Project (Number/Name) 798 / *Defense Support Teams*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
798: *Defense Support Teams*	-	2.483	9.204	8.369	-	8.369	-	-	-	-	-	-
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.

This project code continues 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 2020	FY 2021	FY 2022
Title: Defense Support Teams	2.483	9.204	8.369
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 2021 Plans: This project provides 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 effectiveness of the DoD investments; and oversight of S&T issues and initiatives and responding to Congressional special interests. The program also conducts 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.			
FY 2022 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0605798D8Z / *Defense Technology Analysis*	**Project (Number/Name)** 798 / *Defense Support Teams*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Continue to provide engineering, scientific, analytical, and managerial support to the OUSD(R&E) in developing strategies, plans, and policies to develop and exploit technology; conduct technology analyses, make recommendations, and develop guidance for S&T plans and programs; review acquisition programs and make recommendations to optimize effectiveness of the DoD investments; and oversight of S&T issues and initiatives and respond to Congressional special interests. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Decrease in funding due to other DoD priorities.			
Accomplishments/Planned Programs Subtotals	2.483	9.204	8.369

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605798D8Z / *Defense Technology Analysis*	Project (Number/Name) 728 / *Homeland Defense Capability Development*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
728: *Homeland Defense Capability Development*	-	0.000	3.500	2.440	-	2.440	-	-	-	-	-	-
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

The Homeland Defense Capability Development Initiatives project uniquely engages with the Services, Combatant Commands, and our federal partners on critical Science and Technology (S&T) initiatives to address technology application in support of countering small Unmanned Aircraft System (sUAS) threats to our military forces and installations both domestically and abroad. Work in this project explores and identifies critical technology needs and enables development of synergistic science and technology strategies across for platforms and weapons systems, including unmanned systems technologies, directed energy, materials, munitions, power and energy across the domains of Air, Land, Sea and Space and their applications to future force projection and protection capabilities as identified in the National Defense Strategy.

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.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Homeland Defense Capability Development Initiatives	-	3.500	2.440
FY 2021 Plans: Provide S&T and research, development, test and evaluation (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; 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, supporting NDS global trends on technology; establish baseline of science and technology strategies for platforms and weapons system critical technology needs in the near-, mid-, and far-terms required to mitigate advanced threats to military forces and installations.			
FY 2022 Plans: Continue to 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; Continue to support analysis to include the discrimination of 5G-			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0605798D8Z / *Defense Technology Analysis*	**Project (Number/Name)** 728 / *Homeland Defense Capability Development*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
enabled autonomous threats, interagency Unmanned Aircraft Systems (UAS) technology projects, defense against autonomous systems, and defense against projected homeland air threats, supporting NDS global trends on technology; conduct strategic studies, analyses and modeling to identify critical technologies required to enable advanced force projection and protection capabilities such as the ability to mitigate adversary large- scale collaborative engagement and swarming of munitions and unmanned systems. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Decrease in funding due to other DoD priorities.			
Accomplishments/Planned Programs Subtotals	-	3.500	2.440

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

THIS PAGE INTENTIONALLY LEFT BLANK

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 0605804D8Z / *Development Test & Evaluation*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	118.329	21.422	27.198	27.366	-	27.366	-	-	-	-	-	-
804: *Development Test & Evaluation*	118.329	21.422	20.198	20.391	-	20.391	-	-	-	-	-	-
048: *Cybersecurity DT&E for Weapon Systems*	0.000	0.000	7.000	6.975	-	6.975	-	-	-	-	-	-

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 the Department of Defense (DoD) Directive 5137.02 dated July 15, 2020. In FY 2020, USD(R&E) established the office of the Director, Developmental Test, Evaluation, and Assessments (DTE&A) to provide consolidate Developmental Test and Evaluation (DT&E) and Independent Technical Assessment functions in a single office. The Director, DTE&A is the principal advisor to the Secretary of Defense; the Under Secretary of Defense for Research and Engineering (USD(R&E)); and the Under Secretary of Defense, Acquisition and Sustainment (USD(A&S)) on DT&E and Technical Risk Assessments 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) ensures programs meet interoperability requirements to deepen interoperability and Strengthen Alliances. Finally, OUSD(R&E) works with Director, Operational Test and Evaluation 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), 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; supports development of the defense acquisition workforce Test and Evaluation (T&E) career field; and supports development of policy and guidance for the conduct of DT&E within the DoD. Beginning in FY 2021, USD(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 2022 Office of the Secretary Of Defense					Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support*			R-1 Program Element (Number/Name) PE 0605804D8Z / *Development Test & Evaluation*		
B. Program Change Summary ($ in Millions)	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**
Previous President's Budget	22.203	27.198	27.634	-	27.634
Current President's Budget	21.422	27.198	27.366	-	27.366
Total Adjustments	-0.781	0.000	-0.268	-	-0.268
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.778	-			
• Program Adjustments	-0.003	-	-0.268	-	-0.268

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense											Date: May 2021	
Appropriation/Budget Activity 0400 / 6					R-1 Program Element (Number/Name) PE 0605804D8Z / *Development Test & Evaluation*				Project (Number/Name) 804 / *Development Test & Evaluation*			
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
804: *Development Test & Evaluation*	118.329	21.422	20.198	20.391	-	20.391	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Project 804 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). For ACAT ID programs, review and approve/disapprove the DT&E strategy/plans within the TEMP. For ACAT IB/IC programs, review the DT&E strategy/plans within the TEMP and provide a recommendation to the Service Milestone Decision Authority as to whether or not the strategy is adequate.
- 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.
- 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.
- Manage the Scientific Test and Analysis Techniques Center of Excellence (STAT COE). Over the last eight years, the STAT COE has supported over 66 Acquisition Program Managers in the development of statistically optimized test programs. These efforts have resulted in 464 more efficient and effective test designs, test cost avoidance of over $200 million, and development of 68 test planning and analysis best practices averaging over 2000 downloads monthly.
- 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).
- 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.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0605804D8Z / *Development Test & Evaluation*	**Project (Number/Name)** 804 / *Development Test & Evaluation*

- 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 were 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 2020	FY 2021	FY 2022
Title: Development Test and Evaluation	21.422	20.198	20.391
Description: This program supports and improves the DT&E efforts of Major Defense Acquisition Program (MDAP), 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 2021 Plans:*** - Worked with Adaptive Acquisition Framework Program Managers, Chief Developmental Testers, and Lead DT&E organizations to improve DT&E planning; and developed comprehensive and efficient DT&E strategies/plans through the use of disciplined Developmental Evaluation Framework Matrices and Scientific Test and Analysis Techniques (STAT). - Supported rapid prototyping, rapid fielding, and technology demonstrations efforts in the development of tailored comprehensive, efficient, and innovative DT&E strategies/plans. - Promoted 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. - For ACAT ID programs, reviewed/approved TEMPs submitted to support milestone reviews. Ensured DT&E planning was complete prior to the start of DT&E activities. For ACAT IB/IC programs, reviewed the DT&E strategy/plans within the TEMP, and provided a recommendation to the Service Milestone Decision Authority as to whether or not the strategy was adequate. - Supported the development and refinement of DT&E policies and methodologies addressing DT&E across all Acquisition programs. - For ACAT ID programs, published 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, provided independent developmental test assessments in support of USD(A&S) and Service Major Defense Acquisition Programs. - Promoted the application of sound DT&E and related technical disciplines across the Department's acquisition community and programs.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0605804D8Z / *Development Test & Evaluation*	**Project (Number/Name)** 804 / *Development Test & Evaluation*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
- Promoted and implemented initiatives that evolve the DT&E 'state of practice' to keep pace with emerging technologies and improve test efficiency to field systems faster. ***FY 2022 Plans:*** - 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). - Continue to support rapid prototyping, rapid fielding, and technology demonstrations efforts in the development of tailored comprehensive, efficient, and innovative DT&E strategies/plans. - 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. - For ACAT ID programs, review/approve all TEMPs submitted to support milestone reviews. Ensure DT&E planning is complete prior to the start of DT&E activities. For ACAT IB/IC programs, review the DT&E strategy/plans within the TEMP and provide a recommendation to the Service Milestone Decision Authority as to whether or not the strategy is adequate. - Refine DT&E policies and methodologies addressing DT&E across all Acquisition programs. - 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. - 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. - Promote the application of sound DT&E and related technical disciplines across the Department's acquisition community and programs. - Implement initiatives that evolve the DT&E 'state of practice' to keep pace with emerging technologies and improve test efficiency to field systems faster. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** No significant changes.			
Accomplishments/Planned Programs Subtotals	21.422	20.198	20.391

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0605804D8Z / *Development Test & Evaluation*	**Project (Number/Name)** 804 / *Development Test & Evaluation*

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605804D8Z / *Development Test & Evaluation*	Project (Number/Name) 048 / *Cybersecurity DT&E for Weapon Systems*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
048: *Cybersecurity DT&E for Weapon Systems*	0.000	0.000	7.000	6.975	-	6.975	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Beginning in FY 2021, this project provides 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). For ACAT ID programs, 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 2020	FY 2021	FY 2022
Title: Cybersecurity DT&E for Weapon Systems	0.000	7.000	6.975

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0605804D8Z / *Development Test & Evaluation*	**Project (Number/Name)** 048 / *Cybersecurity DT&E for Weapon Systems*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Description: Beginning in FY 2021, this program supports and improves the Cybersecurity DT&E efforts of Major Defense Acquisition Program (MDAP), 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. ***FY 2021 Plans:*** - Worked with Acquisition Program Managers, Chief Developmental Testers, and Lead DT&E organizations to improve Cybersecurity DT&E planning and developed comprehensive and efficient DT&E strategies/plans through the use of disciplined Developmental Evaluation Framework Matrices and Scientific Test and Analysis Techniques (STAT). - Supported rapid prototyping, rapid fielding, and technology demonstrations efforts in the development of tailored comprehensive, efficient, and innovative Cybersecurity DT&E strategies/plans. - Promoted 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 increased the amount and quality of data available to support production decisions. - Supported the development and refinement of Cybersecurity DT&E policies and methodologies addressing Cybersecurity DT&E across all Acquisition programs. - When requested by the Secretary or Deputy Secretary of Defense, provided independent Cybersecurity developmental test assessments in support of USD(A&S) and Service Major Defense Acquisition Programs. - Promoted the application of sound Cybersecurity DT&E and related technical disciplines across the Department's acquisition community and programs. - Implemented initiatives that evolve the Cybersecurity DT&E 'state of practice' to keep pace with emerging technologies and improve test efficiency to field systems faster. - Promoted and implemented 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. - Collaborated with the Intelligence communities to improve cyber intelligence support to Cybersecurity DT&E. - Worked 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. ***FY 2022 Plans:*** - 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). - Support rapid prototyping, rapid fielding, and technology demonstrations efforts in the development of tailored comprehensive, efficient, and innovative Cybersecurity DT&E strategies/plans.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0605804D8Z / *Development Test & Evaluation*	**Project (Number/Name)** 048 / *Cybersecurity DT&E for Weapon Systems*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
- 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. - Refine Cybersecurity DT&E policies and methodologies addressing Cybersecurity DT&E across all Acquisition programs. - 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. - Promote the application of sound Cybersecurity DT&E and related technical disciplines across the Department's acquisition community and programs. - 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. - 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. - Collaborate with the Intelligence communities to improve cyber intelligence support to Cybersecurity DT&E. - 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. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** No significant changes.			
Accomplishments/Planned Programs Subtotals	0.000	7.000	6.975

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A.

THIS PAGE INTENTIONALLY LEFT BLANK

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 0606100D8Z / *Budget and Program Assessments*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	39.825	8.723	10.099	15.438	-	15.438	-	-	-	-	-	-
101: *Budget and Program Assessments*	39.825	4.723	5.362	8.250	-	8.250	-	-	-	-	-	-
118: *Enterprise VAMOSC*	0.000	4.000	4.737	7.188	-	7.188	-	-	-	-	-	-

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.

The FY 2022 budget proposal continues resources to support the Enterprise Visibility 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 directly support development and reporting of readiness metrics associated with implementation of the National Defense Strategy. In FY 2022 CAPE will continue to design and develop an enterprise data platform to serve as the authoritative source of O&S cost data for major weapon systems.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 0606100D8Z / *Budget and Program Assessments*

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	8.017	13.173	15.330	-	15.330
Current President's Budget	8.723	10.099	15.438	-	15.438
Total Adjustments	0.706	-3.074	0.108	-	0.108
• Congressional General Reductions	-	-3.074			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Program Adjustment	0.706	-	0.108	-	0.108

Change Summary Explanation

The FY 2022 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.

The FY 2022 funding request was reduced by $0.766 million to account for the availability of prior year execution balances.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0606100D8Z / *Budget and Program Assessments*	Project (Number/Name) 101 / *Budget and Program Assessments*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
101: *Budget and Program Assessments*	39.825	4.723	5.362	8.250	-	8.250	-	-	-	-	-	-
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 2020	FY 2021	FY 2022
Title: OSD Support for Programming Budget	4.723	5.362	8.250
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. ***FY 2021 Plans:*** Studies, analyses, and assessments will be focused on: - Improving cost analysis tools to inform program, budget, and Defense Acquisition Board reviews. - 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.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0606100D8Z / *Budget and Program Ass essments*	**Project (Number/Name)** 101 / *Budget and Program Assessments*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
- 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. - 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. - 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. - Modeling logistical vulnerabilities against various threats and in various operational environments. Assessing the cost and mission effectiveness of proposed improvements. - 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 2022 Plans:*** Studies, analyses, and assessments will be focused on: - Improving cost analysis tools to inform program, budget, and Defense Acquisition Board reviews. - 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. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 funding increase 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.			
Accomplishments/Planned Programs Subtotals	4.723	5.362	8.250

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 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0606100D8Z / *Budget and Program Assessments*	Project (Number/Name) 118 / *Enterprise VAMOSC*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
118: *Enterprise VAMOSC*	0.000	4.000	4.737	7.188	-	7.188	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Enterprise Visibility and Management of Operating and Support Cost (EVAMOSC) 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 2020	FY 2021	FY 2022
Title: Enterprise Visibility and Maintainability of Operating and Support Costs (EVAMOSC)	4.000	4.737	7.188

Description: EVAMOSC 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.

FY 2021 Plans:

- Design and develop an enterprise data platform to serve as the authoritative source of O&S cost data for major weapon systems
- Develop data ingestion pipelines, business rules, logic models, and data catalogues to support collection, reporting, and analysis of enterprise-level O&S cost data
- 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.

FY 2022 Plans:

Design and develop an enterprise data platform to serve as the authoritative source of O&S cost data for major weapon systems

- Develop data ingestion pipelines, business rules, logic models, and data catalogues to support collection, reporting, and analysis of enterprise-level O&S cost data
- 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.

FY 2021 to FY 2022 Increase/Decrease Statement:

The FY 2022 funding reflects increased resources provided specifically for EVAMOSC in order to meet Title 10 requirements.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0606100D8Z / *Budget and Program Ass essments*	**Project (Number/Name)** 118 / *Enterprise VAMOSC*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
The FY 2022 funding request was reduced by $0.766 million to account for the availability of prior year execution balances.			
Accomplishments/Planned Programs Subtotals	4.000	4.737	7.188

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 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 0606225D8Z / *ODNA Technology & Resource Analysis*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	5.526	3.193	3.200	2.897	-	2.897	-	-	-	-	-	-
106: *Technology and Resource Analysis*	5.526	3.193	3.200	2.897	-	2.897	-	-	-	-	-	-

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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	3.194	3.200	3.088	-	3.088
Current President's Budget	3.193	3.200	2.897	-	2.897
Total Adjustments	-0.001	0.000	-0.191	-	-0.191
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Program Adjustment	-0.001	-	-0.191	-	-0.191

Change Summary Explanation

The FY 2022 funding request was reduced by $0.154 million to account for the availability of prior year execution balances.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0606225D8Z / *ODNA Technology & Resource Analysis*	Project (Number/Name) 106 / *Technology and Resource Analysis*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
106: *Technology and Resource Analysis*	5.526	3.193	3.200	2.897	-	2.897	-	-	-	-	-	-
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 2020	FY 2021	FY 2022
Title: Technology and Resource Analysis	3.193	3.200	2.897

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 2021 Plans:

Continue and initiate efforts to pursue research 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 2022 Plans:

Continue and initiate efforts to pursue research 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 2021 to FY 2022 Increase/Decrease Statement:

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0606225D8Z / *ODNA Technology & Resource Analysis*	**Project (Number/Name)** 106 / *Technology and Resource Analysis*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
The FY 2022 funding request was reduced by $0.154 million to account for the availability of prior year execution balances.			
Accomplishments/Planned Programs Subtotals	3.193	3.200	2.897

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

THIS PAGE INTENTIONALLY LEFT BLANK

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 0606771D8Z / *Cyber Resiliency & Cybersecurity Policy*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	-	0.000	0.000	31.638	-	31.638	-	-	-	-	-	-
145: *Cyber Resiliency & Cybersecurity Policy*	-	0.000	0.000	31.638	-	31.638	-	-	-	-	-	-

Note

Cyber Resiliency & Cybersecurity Policy 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

Cyber Resiliency & Cybersecurity Policy program supports the efforts of OUSD A&S Chief Information Security Office, focusing on the defense of the Department's critical mission weapon systems and Defense Critical Infrastructure from cyber attack, protecting the Department's sensitive unclassified information residing within the Defense Industrial Base(DIB) sector and supply chain, and capability portfolio management for Joint Cyber Capabilities used by the Cyber Mission Force. This program funds the following critical efforts:

1) Cybersecurity for Weapon Systems and Critical Infrastructure: Lead the Department's Strategic Cybersecurity Program (SCP) to continue critical weapon systems and defense infrastructure cybersecurity assessments and mitigations. CISO(A&S) Cyber Resiliency efforts are aligned with the following initiatives:

Assess:
- Conduct of mission focused cyber risk assessments for priority Defense Missions in support of CCMDs.
- Conduct Deep Cyber Resiliency Assessments (DCRA) in support of CCMDs and asset owners.

Inventory:
- Develop, sustain, and employ Cyber Risk Mitigation Tool (CRMT), an Enterprise-wide decision support tool for tracking cyber vulnerability assessments and mitigations.

Prioritize:
- Prioritize Cyber Risk Mitigations based upon mission analysis conducted by Mission Focused Cyber Hardening Teams.

2) DIB Cybersecurity
- Determine the resilience and cybersecurity of DIB contractors and their suppliers which support the associated research, design, development, production, sustainment, and operations of DoD weapon systems.
- Enhance the cybersecurity of the DIB, and improve Supply Chain Risk Management (SCRM) to secure the Department's critical classified and unclassified information.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 0606771D8Z / *Cyber Resiliency & Cybersecurity Policy*

- Implement and update the Cybersecurity Maturity Model Certification (CMMC) risk based framework to enhance the cybersecurity posture of the DIB sector and protect Controlled Unclassified Information (CUI) and Federal Contract Information (FCI).
- Conduct CMMC pilots and risk reduction pathfinders with Services, Agencies, and/or international partners to support the phased rollout.
- Test and demonstrate full operational capability of the CMMC Enterprise Mission Assurance Support Service (eMASS) database and infrastructure.
- Maintain secure data transfers from third party commercial assessment organizations and CMMC eMASS, and between CMMC eMASS and other DoD databases.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	0.000	31.638	-	31.638
Current President's Budget	0.000	0.000	31.638	-	31.638
Total Adjustments	0.000	0.000	0.000	-	0.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0606771D8Z / *Cyber Resiliency & Cyber security Policy*	Project (Number/Name) 145 / *Cyber Resiliency & Cybersecurity Policy*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
145: *Cyber Resiliency & Cybersecurity Policy*	-	0.000	0.000	31.638	-	31.638	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Cyber Resiliency & Cybersecurity Policy 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

Cyber Resiliency & Cybersecurity Policy program supports the efforts of OUSD A&S Chief Information Security Office focusing on the defense of the Department's critical mission weapon systems and Defense Critical Infrastructure from cyber attack, protecting the Department's sensitive unclassified information residing within the defense industrial base(DIB) sector and supply chain, and capability portfolio management for Joint Cyber Capabilities used by the Cyber Mission Force.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Cyber Resiliency & Cybersecurity Policy	-	-	31.638
FY 2022 Plans: Cybersecurity for Weapon Systems and DCI: - Lead the Department's Strategic Cybersecurity Program (SCP) to continue critical weapon systems and defense infrastructure cybersecurity assessments and mitigations. Conduct SCP Pilots to inform cybersecurity best practices for weapon systems in development using multiple acquisition pathways. - Perform Mission Level Cyber Risk Assessments: 1) Plan and Execute Mission Resiliency (MR) II in coordination with the USTRANSCOM and USECUOM. 2) Plan and Execute MR III in collaboration with USSPACECOM. 3) Perform Deep Cyber Resiliency Assessments (DCRAS) in support of CCMD priorities. - Prioritize Mitigations based upon mission analysis conducted by Mission Focused Cyber Hardening Teams. Develop and deploy the CRMT to maintain a Master Cyber Risk Inventory for the Department of Defense for Weapon Systems and DCI based upon CRAs/DCRAs, and other assessments DIB Cybersecurity: - Update and refine CMMC framework based on emerging cyber threats, adjudication of public comments to the interim rule, and outputs from the initial phased rollout			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0606771D8Z / *Cyber Resiliency & Cyber security Policy*	**Project (Number/Name)** 145 / *Cyber Resiliency & Cybersecurity Policy*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
- Conduct CMMC pilots and risk reduction pathfinders with Services, Agencies, and/or international partners to support the phased rollout - Plan for the phased rollout of acquisitions that implement enhanced cybersecurity requirements (i.e. CMMC Level 4 or 5 requirement) and acquisitions with international contractors/subcontractors within the multi-tier supply chain - Test and demonstrate full operational capability of the CMMC Enterprise Mission Assurance Support Service (eMASS) database and infrastructure - Partner with the DIB sector to analyze and demonstrate promising and cost-effective capabilities and candidate solutions related to supply chain risk management and DIB cybersecurity - Work with DoD stakeholders and appropriate organizations dedicated to enhancing the training and education of cybersecurity best practices to the DIB sector with an emphasis on small businesses and manufacturers Capability Portfolio Management for Cyber Capabilities: - Advance and mature capabilities for conducting mission engineering for cyberspace operations. - 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. - 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. - Manage the portfolio of DoD cyber training systems; including the DoDs PCTE and govern the PCTE as a member of the PCTE governance boards. - Conduct Cybersecurity Review of Joint Cyber Capabilities in development. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** This is not an increase. It is a continuation of efforts previously contained in PE 0604771D8Z, Joint Tactical Information Distribution System.			
Accomplishments/Planned Programs Subtotals	-	-	31.638

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 0203345D8Z / *Defense Operations Security Initiative (DOSI)*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	9.892	7.775	3.099	2.925	-	2.925	-	-	-	-	-	-
345: *Defense Operations Security Initiative*	9.892	7.775	3.099	2.925	-	2.925	-	-	-	-	-	-

Program MDAP/MAIS Code:
Project MDAP/MAIS Code(s): 003

A. Mission Description and Budget Item Justification

Defense Operations Security Initiative (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 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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	8.037	3.099	3.164	-	3.164
Current President's Budget	7.775	3.099	2.925	-	2.925
Total Adjustments	-0.262	0.000	-0.239	-	-0.239
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.262	-			
• Program Adjustment	-	-	-0.239	-	-0.239

Change Summary Explanation

No significant program adjustments.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0203345D8Z / *Defense Operations Security Initiative (DOSI)*	Project (Number/Name) 345 / *Defense Operations Security Initiative*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
345: *Defense Operations Security Initiative*	9.892	7.775	3.099	2.925	-	2.925	-	-	-	-	-	-
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 2020	FY 2021	FY 2022
Title: Defense Operations Security Initiative	7.775	3.099	2.925
Description: RDT&E investments focused on countering advances in non-U.S. ISR capabilities and denying adversaries' 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.			
FY 2021 Plans: - Lead research, development and testing activities across three diverse efforts focusing on denying Foreign Intelligence Security Services (FISS) access to critical information. - Provide oversight and advocacy for transitioning developed capabilities into formalized program offices and program executive offices across DoD Components. - 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.			
FY 2022 Plans: - Continue to oversee research, development, and testing on next generation capabilities that counter foreign ISR capabilities and deny adversaries' understanding of U.S. capability, capacity and readiness. - Continue to provide oversight and advocacy for transitioning developed capabilities into formalized program offices and program executive offices across DoD Components.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0203345D8Z / *Defense Operations Security Initiative (DOSI)*	**Project (Number/Name)** 345 / *Defense Operations Security Initiative*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
- 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. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** No significant change.			
Accomplishments/Planned Programs Subtotals	7.775	3.099	2.925

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
• O&M PE 0203345D8Z: *Defense Operations Security Initiative*	1.681	0.000	0.000	0.000	0.000	-	-	-	-	-	-

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.

THIS PAGE INTENTIONALLY LEFT BLANK

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 0303260D8Z / *Defense Military Deception Program Office (DMDPO)*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	0.965	0.984	1.014	0.969	-	0.969	-	-	-	-	-	-
891: *Defense Military Deception Program*	0.965	0.984	1.014	0.969	-	0.969	-	-	-	-	-	-
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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	1.014	1.036	1.048	-	1.048
Current President's Budget	0.984	1.014	0.969	-	0.969
Total Adjustments	-0.030	-0.022	-0.079	-	-0.079
• Congressional General Reductions	-	-0.022			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Program Adjustment	-0.030	-	-0.079	-	-0.079

Change Summary Explanation

No significant change.

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Defense Military Deception Program Office	0.984	1.014	0.969

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 0303260D8Z / *Defense Military Deception Program Office (DMDPO)*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022

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 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.

FY 2021 Plans:
- Oversee research, development and testing programs related to Sensitive Messaging affiliated with current Combatant Command (CCMD) and Service requirements.
- Provide oversight and advocacy for transitioning developed capabilities into formalized program offices and program executive offices across DoD Components.
- 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.
- Provide technical SME expertise to integrate Sensitive Messaging core concepts into SECDEF-directed program that, among other things, directs OSD to research, develop, and evaluate novel ways to utilize Sensitive Messaging, Deception, Influence, and other Operations in the Information Environment.

FY 2022 Plans:
- Continue to oversee research, development and testing programs related to Sensitive Messaging affiliated with current CCMD and Service requirements.
- Continue to provide oversight and advocacy for transitioning developed capabilities into formalized program offices and program executive offices across DoD Components.
- 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.
- Continue to provide technical SME expertise to integrate Sensitive Messaging core concepts into SECDEF-directed program that, among other things, directs OSD to research, develop, and evaluate novel ways to utilize Sensitive Messaging, Deception, Influence, and other Operations in the Information Environment.

FY 2021 to FY 2022 Increase/Decrease Statement:

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 0303260D8Z / *Defense Military Deception Program Office (DMDPO)*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
No significant change.			
Accomplishments/Planned Programs Subtotals	0.984	1.014	0.969

D. Other Program Funding Summary ($ in Millions)

Line Item	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
• 0303260D8Z O&M DW: *Defense Military Deception Program Office*	1.058	1.105	0.736	-	0.736	-	-	-	-	-	-

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.

• 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.

THIS PAGE INTENTIONALLY LEFT BLANK

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 0305245D8Z / *Intelligence Capabilities and Innovation Investments*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	188.856	15.868	0.000	0.000	-	0.000	-	-	-	-	-	-
245: *Intelligence Capabilities and Innovation Investments*	188.856	15.868	0.000	0.000	-	0.000	-	-	-	-	-	-

Note

The Defense Intelligence Innovation Office (DI2O) was eliminated in FY 2021.

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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	15.871	0.000	0.000	-	0.000
Current President's Budget	15.868	0.000	0.000	-	0.000
Total Adjustments	-0.003	0.000	0.000	-	0.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Program Adjustment	-0.003	-	-	-	-

Change Summary Explanation

The Defense Intelligence Innovation Office (DI2O) was eliminated in FY 2021.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0305245D8Z / *Intelligence Capabilities and Innovation Investments*	Project (Number/Name) 245 / *Intelligence Capabilities and Innovation Investments*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
245: *Intelligence Capabilities and Innovation Investments*	188.856	15.868	0.000	0.000	-	0.000	-	-	-	-	-	-
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 2020	FY 2021	FY 2022
Title: Intelligence Capabilities and Innovation Investments	15.868	0.000	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. ***FY 2021 Plans:*** Program was discontinued in FY 2021. ***FY 2022 Plans:*** Program was discontinued in FY 2021.			
Accomplishments/Planned Programs Subtotals	15.868	0.000	0.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

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.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 0307588D8Z *I Algorithmic Warfare Cross Functional Team (AWCFT)*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	0.000	232.946	0.000	0.000	-	0.000	-	-	-	-	-	-
590: *Algorithmic Warfare Cross Functional Team (AWCFT)*	0.000	232.946	0.000	0.000	-	0.000	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

The Algorithmic Warfare Cross Functional Team (Project Maven) is the pathfinder artificial intelligence (AI) initiative for the DoD that accelerates the integration of AI into DoD systems to improve warfighting speed and lethality for a rapidly innovating Joint Force. Maven deploys capabilities that complement human cognition by augmenting and automating key tasks of object identification and tracking, and by deriving insights from large-scale data sets to create actionable intelligence. Maven's AI architecture initially augmented Processing, Exploitation and Dissemination (PED) of Full Motion Video (FMV) from Tactical and Medium Altitude Unmanned Aerial Vehicles (TUAVs). Maven additionally developed algorithms for Wide Area Motion Imagery (WAMI), commercial and military SAR and EO satellite imagery to support the National Defense Strategy (NDS). Maven also includes AI for Captured Enemy Material (CEM), Maritime, Overhead Persistent Infrared Programs (OPIR), and Public Available Information (PAI) exploitation. Most military intelligence exploitation systems were designed pre-AI and require specialized integration and multiple individuals to control and then enable the insertion of algorithms into their software baseline. Maven developed a path forward to eliminate substantial costs and coordination among myriad legacy projects to instead use a single screen with multiple AI-enabled layers and tools. Altogether, Maven increased the value of ISR, reduced the human burdens so analysts could multi-task and produce more intel, and now detects, classifies, and tracks objects exponentially faster than a human. With FMV intel, for example, Maven detects persons, vehicles, and weapons systems. By combining AI detections, tracks, and insights onto a single screen, Maven created tools for deployment to help mission commanders, operations personnel, and intel analysts to unite their increased productivity in conducting military operations in every domain of warfare – air, land, sea, space, and cyberspace.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	221.235	0.000	0.000	-	0.000
Current President's Budget	232.946	0.000	0.000	-	0.000
Total Adjustments	11.711	0.000	0.000	-	0.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• COVID19 Related Services	11.711	-	-	-	-

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 0307588D8Z *I Algorithmic Warfare Cross Functional Team (AWCFT)*

Change Summary Explanation

Funds transferred from BA-6 to BA-8 Software and Digital Technology Pilot programs starting FY 2021.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0307588D8Z / *Algorithmic Warfare Cross Functional Team (AWCFT)*	Project (Number/Name) 590 / *Algorithmic Warfare Cross Functional Team (AWCFT)*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
590: *Algorithmic Warfare Cross Functional Team (AWCFT)*	0.000	232.946	0.000	0.000	-	0.000	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Funds transferred from BA-6 to BA-8 Software and Digital Technology Pilot programs in FY 2021.

A. Mission Description and Budget Item Justification

Project Maven funds and fields increasing amounts of augmentation and automation to FMV ground exploitation stations for TUAVs, to Medium Altitude, High Altitude ISR platforms and commercial and military satellite imagery. Project Maven accelerates the development and deployment of AI capabilities across the Defense Intelligence Enterprise, including exploitation of CEM, Maritime, OPIR and PAI. In these areas, Maven uses AI, deep learning, and algorithms to detect, classify, and track objects not only within FMV images (e.g., persons, vehicles, and weapons) but also to provide insights in combinations of these and other areas of imagery, data, and text and sensor-based projects. Maven algorithms increase the intelligence value of ISR, reduce the human burden of screening and analyzing, and provides insight from GEOINT and other intelligence areas. To produce these results, Project Maven funds advances in commercial technologies to insert commercial AI into existing platforms and programs of record, providing new uses for legacy systems and sensors. 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 in support of the NDS. As Maven algorithms increase in capability, the algorithms have moved to the edge (on sensor platforms). Additional details on missions and capabilities are available at a higher classification level.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Algorithmic Warfare Cross Functional Team (AWCFT)	232.946	-	-
Description: Project Maven is a rapid fielding AI program that augments and automates PED for FMV of TUAVs, Medium Altitude, High Altitude, WAMI ISR, and other platforms in support of the NDS peer/near peer competitor strategy. Aside from imagery, Maven also uses AI to exploit CEM, Maritime, OPIR and PAI. Maven's AI, deep learning, and computer vision algorithms and insights are used in theater to detect, classify, and track objects within FMV images (e.g., person, vehicle, and weapon) as well as other projects, such as CEM and text-based projects. Maven algorithms increase the intelligence value of ISR and reduce the human burden of screening so analysts can multi-task, so that analysts and operations personnel can more effectively and rapidly react or more efficiently plan, and so that operations personnel can maintain increased situational awareness. Project Maven, as the pathfinder AI initiative for the DoD, continues to invest in critical architecture to support the rapid expansion of AI to other mission areas besides GEOINT. While most military intelligence exploitation systems were designed pre-AI and require specialized integration to enable the insertion of algorithms into the software baseline, Maven has funded multiple means of bridging these gaps. Project Maven's commercial technology vendors continue to compete for the opportunity to be inserted			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 6	**R-1 Program Element (Number/Name)** PE 0307588D8Z / *Algorithmic Warfare Cross Functional Team (AWCFT)*	**Project (Number/Name)** 590 / *Algorithmic Warfare Cross Functional Team (AWCFT)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
into existing programs of record. As Maven algorithms increase in capability, the algorithms have moved to the edge (on sensor platforms). Additional details on accomplishments and capabilities are available at a higher classification level.			
Accomplishments/Planned Programs Subtotals	232.946	-	-

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
• O&M PE0307588D8Z: *Algorithmic Warfare Cross Functional Team (AWCFT)*	21.663	4.848	4.929	-	4.929	-	-	-	-	-	-
• PROC PE0307588D8Z: *Algorithmic Warfare Cross Functional Team (AWCFT)*	8.206	0.000	0.000	-	0.000	-	-	-	-	-	-

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 available to cross-functional teams. Management uses project management tools, executive steering group and working group meetings to ensure that stated capabilities and performance criteria are delivered.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 0607210D8Z / *Industrial Base Analysis and Sustainment Support*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	126.143	101.760	172.145	58.189	-	58.189	-	-	-	-	-	-
819: *Industrial Base Analysis and Sustainment*	126.143	101.760	172.145	50.189	-	50.189	-	-	-	-	-	-
821: *Microelectronics*	-	0.000	0.000	8.000	-	8.000	-	-	-	-	-	-

Note

FY 2022 new starts include Defense Microelectronics Cross-Functional Team, established in January 2021, and Rare Earth Elements - Heavy Element Separation.

A. Mission Description and Budget Item Justification

Industrial Base Analysis and Sustainment Support (IBAS) was established in accordance with 10 USC Sec 2508 Industrial Base Fund. The mission is 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 2021 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 uses a multi-pronged approach to identify projects. We: 1) conduct assessments of the national technology and industrial base using the OUSD Acquisition & Sustainment (A&S), Office of Deputy Assistant Secretary of Defense (ODASD) Industrial Policy as directed by 10 U.S. Code 2505; 2) work in close partnership with defense programs; and 3) work directly with industry. ODASD (Industrial Policy) collaborates with the services and agencies to perform 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 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 0607210D8Z / *Industrial Base Analysis and Sustainment Support*

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	104.051	9.151	9.896	-	9.896
Current President's Budget	101.760	172.145	58.189	-	58.189
Total Adjustments	-2.291	162.994	48.293	-	48.293
• Congressional General Reductions	-	-0.006			
• Congressional Directed Reductions	-0.018	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	163.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	0.500	-			
• SBIR/STTR Transfer	-2.773	-			
• Program Adjustments	-	-	48.293	-	48.293

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2020	FY 2021
Project: 819: *Industrial Base Analysis and Sustainment*		
Congressional Add: *Program Increase*	7.479	15.000
Congressional Add: *Submarine Workforce Development*	8.000	20.000
Congressional Add: *Manufacturing Engineering*	12.500	-
Congressional Add: *Advanced Armor Piercing Penetrator/ Risk Reduction for Tungsten Defense Products*	12.000	5.000
Congressional Add: *Lead-free Electronics*	5.000	10.000
Congressional Add: *Precision Optics Manufacturing*	7.500	4.000
Congressional Add: *Machine Tooling and Advanced Manufacturing*	20.000	20.000
Congressional Add: *Automated textile manufacturing*	9.000	10.000
Congressional Add: *Interdisciplinary center for advanced manufacturing systems*	5.000	7.500
Congressional Add: *Rare Earth Elements from Coal Ash*	5.000	-
Congressional Add: *Shape Memory Alloys*	-	5.000
Congressional Add: *High Performance Weldable Armor*	-	5.000
Congressional Add: *Weldable Ultra Hard Armor*	-	10.000
Congressional Add: *Industrial Skills*	-	3.500
Congressional Add: *Pilot Mask Technology*	-	10.000

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 0607210D8Z *I Industrial Base Analysis and Sustainment Support*

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2020	FY 2021
Congressional Add: *Active Matrix Organic Light Emitting Diode*	-	5.000
Congressional Add: *Advanced nanomaterials manufacturing*	-	10.000
Congressional Add: *Munitions Supply Chain Expansion*	-	2.000
Congressional Add: *Advanced manufacturing workforce development*	-	6.000
Congressional Add: *Frequency Selective Limiters*	-	5.000
Congressional Add: *Freeze Dried Plasma*	-	10.000
Congressional Add Subtotals for Project: 819	91.479	163.000
Congressional Add Totals for all Projects	91.479	163.000

Change Summary Explanation

Program changes support Defense Microelectronics Cross-Functional Team and Rare Earth Elements - Heavy Element Separation.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 7	R-1 Program Element (Number/Name) PE 0607210D8Z / *Industrial Base Analysis and Sustainment Support*	Project (Number/Name) 819 / *Industrial Base Analysis and Sustainment*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
819: *Industrial Base Analysis and Sustainment*	126.143	101.760	172.145	50.189	-	50.189	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

IBAS program investment strategies are informed by findings from the Executive Order (EO) 13806 report, "Assessing and Strengthening the Manufacturing and Defense Industrial Base and Supply Chain Resiliency of the United States," and follow-on industrial base and technology assessments. IBAS uses the report's foundational risk framework to identify and address risks and inform investments.

National Imperative for Industrial Skills. Addressing a cross-cutting need of the Department as impacted by the pervasive shortages of skilled industrial workers, especially in the manufacturing trades, and affecting all major DoD Acquisition systems and operations and sustainment sectors, the IBAS program established an integrated portfolio of workforce development investment projects as part of a broad initiative. Titled the "National Imperative for Industrial Skills," the initiative's objective is to help rapidly catalyze an effective public-private response that builds-out a robust national industrial skills workforce development ecosystem to 1) close existing industrial workforce skill gaps, with a particular (but not sole) focus on the skilled manufacturing trades on which the DoD relies (for example, precision machining, welding of all types, and metrology), and 2) leverage these gap-closing efforts to create the conditions for sustained, multi-sector growth of national production capacities and improved industrial resiliency. The operational and aspirational goals of the initiative are to appropriately apply DoD's credibility, convening power and catalyzing strength to help: 1) promote prestige of manufacturing and related careers and inspire the next generation of industrial skills professionals; 2) accelerate workers into and through training/development pipelines, at appropriate scale and velocity; and 3) elevate U.S. manufacturing to world-leading status. To properly bound the effort, the majority of investments are aligned with the Department's programs of record to help close known or projected industrial workforce gaps and mitigate associated workforce risks; additional, targeted investments are focused on meeting important crosscutting workforce development needs that benefit multiple acquisition and sustainment programs. Examples include partnering with and assisting industry, academia, regional, state, local and other federal activities in establishing new and/or expanded defense-relevant curricula and programs, and performing data analytics to inform future investments and action. In FY 2020, the IBAS program office issued a single, overarching Cornerstone Initiative Request (CIR) supporting this initiative. The CIR utilizes 10 U.S.C. § 2371b Other Transaction (OT) prototyping authorities and serves as a standing (five-year) acquisition platform. Twelve IBAS funded projects have been awarded under this solicitation. Subsequent supporting project calls in FY 2021 and future years will follow a progressive, building block approach based on the initiative's progress against requirements, lessons learned, and the overall maturation of the industrial skills workforce development ecosystem supporting defense industrial base needs. The initiative leverages segments of both its baseline IBAS funding as well as any workforce development-focused congressional interest item funds.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Industrial Base Analysis and Sustainment (IBAS) Support (core program, excludes Congressional Adds)	10.281	9.145	50.189
Description: IBAS currently focuses efforts and investments for all fiscal years in the categories listed below:			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 7	**R-1 Program Element (Number/Name)** PE 0607210D8Z / *Industrial Base Analysis and Sustainment Support*	**Project (Number/Name)** 819 / *Industrial Base Analysis and Sustainment*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
1) Supply Chain Vulnerabilities Mitigation: Continuing investments to mitigate supply chain risks findings from the Executive Order (EO) 13806 and on-going assessments for both traditional defense sectors and cross-cutting sectors. Primary focus areas are ships and subs, casting and forgings, workforce skills for the trades including welding and machining, and machine tools. 2) Radars, Sensors, and Electronics Sectors: Continuing investments to expand the sub-tier supply chain by improving production process efficiencies; establishing open standards; and implementing modular and scalable technology. 3) Materials Sector: Continuing investments to address the technical risk associated with the dependence on materials from foreign non-allied countries for DoD ground, air, and space assets. Heavy Rare Earth Elements is a primary focus, supported by a Congressional add in FY 2020, and a one-year increased investment in FY 2022 funded via internal DoD reprogramming. 4) Munitions and Missiles Sector: Continuing efforts to improve existing production processes, exploring advanced materials for higher performance; and upgrading outdated technology for missile components.			
FY 2021 Plans: 1) Supply Chain Vulnerabilities Mitigation: Industrial Skills Development and Acceleration (National Imperative for Industrial Skills initiative) (NIIS): In FY 2020, the IBAS program office issued a single, overarching Cornerstone Initiative Request (CIR) supporting a new initiative entitled the “National Imperative for Industrial Skills.” NIIS addresses impacts to the DoD driven by shortages of skilled industrial base workers, as described in Section A narrative above. IBAS has awarded nine projects to-date valued at nearly $27 million under this solicitation. Subsequent supporting project calls will follow a progressive, building-block approach based on the initiative’s progress against requirements, lessons learned, and the overall maturation of the industrial skills workforce development ecosystem. These efforts continue through FY 2021, FY 2022 and future fiscal years, providing multiyear focus to partner with industry, academic institutions and other organizations. The focus of these continuing efforts is to prototype and expand education and workforce development pipelines that accelerate entrance into and through the pipeline for Defense critical industrial workforce skills including machining, welding, specialty welding and metrology. 2) Radars, Sensors and Electronics Sector: Radar Affordability Land/Sea: Continuing multi-year effort to improve overall DoD radar supplier resilience. Enables the DoD to leverage small to medium size companies from defense and adjacent industrial markets by establishing common cross-service system requirements; developing commons standards for those requirements; and creating open and modular architectures based on detailed system engineering models. Implements a Radar Supplier Resiliency Plan by establishing the Joint Radar Industrial Base Working Group (JRIBWG) to conduct comprehensive assessments of foreign and domestic radar technical positions and industrial base capabilities. Directed Energy (DE) Supply Chain Assurance: Continuing multi-year effort to improve sub-tier supplier resilience. A cross-service working group was convened to identify supply chain requirements for meeting service program milestone requirements,			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 7	**R-1 Program Element (Number/Name)** PE 0607210D8Z / *Industrial Base Analysis and Sustainment Support*	**Project (Number/Name)** 819 / *Industrial Base Analysis and Sustainment*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
assessing and prioritizing risks for mitigation strategies. FY 2021 activities also included developing mitigation and investment strategies, harmonizing service requirements for DE fielding, and identifying subcomponents for development of common standards and processes to enable a more robust supply chain. ***FY 2022 Plans:*** 1) Supply Chain Vulnerabilities Mitigation: Industrial Skills Development and Acceleration (National Imperative for Industrial Skills initiative) (NIIS): Addressing the pervasive shortages of skilled industrial workers, especially in the manufacturing trades, that negatively affect all major DoD Acquisition systems, operations, and sustainment sectors. FY 2022 continues and expands NIIS multiyear efforts that were initiated in prior years, as addressed in Section A narrative and in FY 2021 Plans above, to partner with industry, academic institutions and other organizations to prototype and expand training development pipelines that accelerate entrance into and through education and workforce development pipelines for Defense critical industrial workforce skills including machining, welding, specialty welding and metrology. 2) Radars, Sensors and Electronics Sector: Radar Affordability Land/Sea: Implementation of Radar Supplier Resiliency Plan and execution of the priorities and decisions of the Department's Joint Radar Industrial Base Working Group (JRIBWG); conduct comprehensive assessments of the foreign and domestic radar technical positions and industrial base capabilities. Directed Energy (DE) Supply Chain Assurance: Continuing multi-year effort to improve sub-tier supplier resilience. A cross-service working group was convened to identify supply chain requirements for meeting service program milestone requirements, assessing and prioritizing risks for mitigation strategies. FY 2021 activities also included developing mitigation and investment strategies, harmonizing service requirements for DE fielding, and identifying subcomponents for development of common standards and processes to enable a more robust supply chain. 3) Materials Sector: Rare Earth Elements - Heavy Element Separation: Continuing investments to address the technical risk associated with the dependence on materials from foreign non-allied countries for DoD ground, air, and space assets. Heavy Rare Earth Elements is a primary focus, supported by a Congressional add in FY 2020, and a DoD funded increase in FY 2022 ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Increase reflects realignment to fund the efforts for Rare Earth Elements - Heavy Element Separation, a joint effort with the Defense Production Act Procurement account.			
Accomplishments/Planned Programs Subtotals	10.281	9.145	50.189

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 7	**R-1 Program Element (Number/Name)** PE 0607210D8Z / *Industrial Base Analysis and Sustainment Support*	**Project (Number/Name)** 819 / *Industrial Base Analysis and Sustainment*

	FY 2020	FY 2021
Congressional Add: Program Increase ***FY 2020 Accomplishments:*** Applied to additional workforce development efforts, Columbia class propulsion, and supply chain analysis in multiple sectors including COVID-19 supply chain requirements. ***FY 2021 Plans:*** Apply to supply chain analysis in multiple sectors including radar resiliency, direct energy supply chain resiliency, and additional workforce development efforts.	7.479	15.000
Congressional Add: Submarine Workforce Development ***FY 2020 Accomplishments:*** Established partnership to identify workforce needs through industry champions and senior executives who have decision-making authority and are passionate about the submarine industrial sector. The Public Private Partnership with Regional States focuses on mitigating shortfalls within the submarine workforce supply chain. This Next Generation Partnership continuously assesses Submarine Shipbuilding workforce needs. Stakeholders develop prototypes for expanding skilled trades' workforce training and up-skilling at velocity in the Submarine Shipbuilding supplier base. The effort will ensure work-ready individuals for the regional Submarine Shipbuilding sector. ***FY 2021 Plans:*** FY 2020 Accomplishments description applies also to FY 2021 Plans. Public private partnership with states mitigating workforce shortfalls within the submarine supply chain.	8.000	20.000
Congressional Add: Manufacturing Engineering ***FY 2020 Accomplishments:*** Created workforce development pipelines for engineering and critical technicians. The COVID-19 pandemic has accelerated and accentuated a fundamental change that has been underway — a change in the education and skills needed to be successful in the DoD workforce today and into the future. Automation technologies, higher levels of digital skills and globally integrated markets are transforming manufacturing requirements at a speed unparalleled in history. In response to these requirements, IBAS initiated a full spectrum approach which incorporates leading edge technologies with academia to provide the DoD with current and next generation workforce to deliver the technology edge to our Warfighter and Nation.	12.500	-
Congressional Add: Advanced Armor Piercing Penetrator/ Risk Reduction for Tungsten Defense Products ***FY 2020 Accomplishments:*** Improved tungsten penetrator production efficiencies and capacities for munitions. As part of this large-scale development effort, an assessment of high performance materials for enhanced armor piercing terminal effects identified tungsten carbide as the material of choice. This initiative enhances and optimizes the manufacturing process of a tungsten carbide component while simultaneously increasing the capacity from 1.5 million to 5 million parts per year to meet the Army's minimum forecasted requirements. The	12.000	5.000

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 7	**R-1 Program Element (Number/Name)** PE 0607210D8Z / *Industrial Base Analysis and Sustainment Support*	**Project (Number/Name)** 819 / *Industrial Base Analysis and Sustainment*

	FY 2020	FY 2021
resulting technology and industrial capabilities develops overmatch capabilities to enable DoD to defeat threats with the new AP ammunition. ***FY 2021 Plans:*** FY 2020 Accomplishments description applies also to FY 2021 Plans. Improve tungsten penetrator production efficiencies and capacities for munitions.		
Congressional Add: Lead-free Electronics ***FY 2020 Accomplishments:*** Established standards to mitigate risk associated with lead-free electronics. Established a public-private partnership framework between the U.S. Government and a new Defense Electronics Consortium (DEC) for electronics to mitigate industrial base risks. The DEC management is provided by a not-for-profit or nonprofit firm. To demonstrate the practical management and operations capabilities of the DECM, the DECM will plan and execute a “pilot” effort on lead-free electronics. ***FY 2021 Plans:*** FY 2020 Accomplishments description applies also to FY 2021 Plans. Establish standards to mitigate risk associated with lead-free electronics.	5.000	10.000
Congressional Add: Precision Optics Manufacturing ***FY 2020 Accomplishments:*** FY 2020 Accomplishments: The objective of the precision optics prototype effort was to evaluate the precision optics manufacturing industrial/technology base and provide a roadmap to ensure DoD requirements were addressed in the areas of electro-magnetic apertures (e.g. sensor windows and domes), directed energy weapons (DEW), and counter-DEW (C-DEW). Precision optics are essential technologies for our nation, which has experienced a steady loss of domestic optics manufacturing at precisely the same time that these technologies are becoming critical to the DoD. Across a broad spectrum of defense applications vulnerabilities exist in the areas of optics supply chain, standards development and implementation, the development of effective workforce training, and certification programs to address existing and emerging skills gaps. ***FY 2021 Plans:*** National Imperative for Industrial Skills (NIIS) - Precision Optics are used in almost every DoD platform but collapse of the commercial optics community and decades of decreased DoD investment has endangered domestic capability for skilled workers and stable suppliers. Multi-prong approach to improve industrial base resilience and expands workforce development programs. First effort will focus on scaling workforce to meet defense needs.	7.500	4.000
Congressional Add: Machine Tooling and Advanced Manufacturing ***FY 2020 Accomplishments:*** Machine Tools Component: Executive Order (EO) 13806 study results found critical and continuing erosion of domestic machine tool industry. In response, this effort established a DoD	20.000	20.000

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 7	**R-1 Program Element (Number/Name)** PE 0607210D8Z / *Industrial Base Analysis and Sustainment Support*	**Project (Number/Name)** 819 / *Industrial Base Analysis and Sustainment*

	FY 2020	FY 2021
partnership with Department of Energy (DoE) Oak Ridge National Lab (ORNL) called “America’s Cutting Edge (ACE).” ACE applies the robust functional capacity of the Manufacturing Demonstration Facility (MDF) as a Hub for a Public-Private Partnership that can leverage an existing $1.5 billion DoE Research and Development (R&D) Partnership to restore U.S. machine tool prominence. Acquisition process and standup was completed in March 2020. ACE has made substantial progress on efforts to: increase productivity of existing industry systems, create design rules and control for hybrid manufacturing processes, and design and test a new “open” machine tool and transfer mechanism for large parts. In support of COVID-19 response, ACE also conducted opportune research by developing and proving tooling and processes to mitigate current and anticipated medical supply and device shortages of N95 masks, face shields, and mask fiber products. Workforce Component: 1) Promote prestige of applying skills relevant to machine tools used in manufacturing and related careers to inspire the next generation of industrial skills professionals; 2) Accelerate workers into and through training and development pipelines to meet requirements; 3) Elevate U.S. manufacturing to world-leading status. ***FY 2021 Plans:*** FY 2020 Accomplishments description applies also to FY 2021 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		
Congressional Add: Automated textile manufacturing ***FY 2020 Accomplishments:*** Integrated automated manufacturing capability with high end advanced fibers. Established partnership to prototype and implement automated manufacturing processes for advanced textiles needed for defense use and develop associated workforce curricula and training programs needed for successful industry adoption and use. ***FY 2021 Plans:*** FY 2020 Accomplishments description applies also to FY 2021 Plans. Integrate automated manufacturing capability with high end advanced fibers.	9.000	10.000
Congressional Add: Interdisciplinary center for advanced manufacturing systems ***FY 2020 Accomplishments:*** Established partnership to lower the barriers for entry to small and medium manufacturers (SMM) to adopt digital and Internet of Things (IOT) 4.0 capabilities. This effort used a multi-prong approach to close the gap of the digital divide between large manufacturers and small and medium	5.000	7.500

	FY 2020	FY 2021
manufacturers. It also closes the gap in the educational pipeline needed to develop the associated workforce pipeline. ***FY 2021 Plans:*** FY 2020 Accomplishments description applies also to FY 2021 Plans. Lower the barriers for entry to small and medium manufacturers to adopt manufacturing capabilities including 5-axis, additive, digital and Internet of Things (IOT) 4.0 capabilities		
Congressional Add: Rare Earth Elements from Coal Ash ***FY 2020 Accomplishments:*** This prototype initiative is part of the DoD's framework to establish a reliable and resilient domestic source of supply for Rare Earth Elements (REE). This cross-cutting prototype project, in parallel with other DoD and Federal projects, was designed to develop REE sources of supply to reduce reliance on foreign sources. In support of the desired end state, the enabling objectives encompass addressing critical issues in: mining capabilities; chemical technology processing; and expansion of the Industrial Base to develop a secure and reliable supply chain for the DoD and the nation's manufacturing base. As a derivative, this project developed several needed Science, Technology, Engineering and Mathematics (STEM) and manufacturing skills within the REE mining and processing workforce.	5.000	-
Congressional Add: Shape Memory Alloys ***FY 2021 Plans:*** Multi-year effort that builds on previous ACE work in hybrid processes. Develop the materials and manufacturing processes to rapidly manufacture complex SMA geometries.	-	5.000
Congressional Add: High Performance Weldable Armor ***FY 2021 Plans:*** Expand workforce for welding of specialty metals.	-	5.000
Congressional Add: Weldable Ultra Hard Armor ***FY 2021 Plans:*** Expand Ground vehicle light weight armor SC. Develop full-scale manufacturing process for producing an ultra-hard armor that is weldable.	-	10.000
Congressional Add: Industrial Skills ***FY 2021 Plans:*** National Imperative for Industrial Skills (NIIS) - Assess requirements, expand recruitment, expand and accelerate training in key sectors as needed.	-	3.500
Congressional Add: Pilot Mask Technology ***FY 2021 Plans:*** Sustain Life Support Supply Chains for Pilot Masks - contracted due to limited investment for pilot masks and related technology. Today's aircraft have surpassed older, obsolete technology.	-	10.000
Congressional Add: Active Matrix Organic Light Emitting Diode	-	5.000

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 7	**R-1 Program Element (Number/Name)** PE 0607210D8Z / *Industrial Base Analysis and Sustainment Support*	**Project (Number/Name)** 819 / *Industrial Base Analysis and Sustainment*

	FY 2020	FY 2021
FY 2021 Plans: Sole Source - Improve and stabilize the single domestic source of organic light emitting diode manufacturing which supports numerous DoD combat platforms.		
Congressional Add: Advanced nanomaterials manufacturing ***FY 2021 Plans:*** Expand SC - No domestic capability exists for mature metal organic frameworks (MOF) compound to meet soldier CBRN filter requirements. Funds will establish domestic capability for to incorporate into M61 filters.	-	10.000
Congressional Add: Munitions Supply Chain Expansion ***FY 2021 Plans:*** Establish Domestic Capability - support F35A 25mm round production to be moved from Switzerland to Camden, AR.	-	2.000
Congressional Add: Advanced manufacturing workforce development ***FY 2021 Plans:*** National Imperative for Industrial Skills (NIIS) - Accelerate production of skilled technicians for defense needs.	-	6.000
Congressional Add: Frequency Selective Limiters ***FY 2021 Plans:*** Expand Defense Industrial Base - Frequency Selective Limiters (FSL) are used to strengthen EW systems against EMI attacks. Current production rates of the substrate Gadolinium Gallium Garget (GGG) used to grow the Yttrium Iron Garnet (YIG) films are insufficient to meet DoD requirements. Effort will expand capacity from 4,000 units to greater than 50,000 units.	-	5.000
Congressional Add: Freeze Dried Plasma ***FY 2021 Plans:*** Onshore Foreign Capability.	-	10.000
Congressional Adds Subtotals	91.479	163.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

NA

D. Acquisition Strategy

NA

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 7	R-1 Program Element (Number/Name) PE 0607210D8Z / *Industrial Base Analysis and Sustainment Support*	Project (Number/Name) 819 / *Industrial Base Analysis and Sustainment*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
IBAS Baseline Program Efforts - Sectors Total	C/Various	various : various	110.974	-		-		-		-		-	-	-	-
Boron Carbide US Sourcing	C/FFP	IAP Worldwide Services : FL	0.500	0.700	Jun 2020	-		-		-		-	-	-	-
Directed Energy Supply Chain Assurance	C/FFP	Systems Innovation Engineering : NJ	-	0.491	Aug 2020	0.356	Apr 2021	0.350	Apr 2022	-		0.350	-	-	-
Heavy Rare Earth Elements Supply Chain Resiliency	C/FFP	(1) MP Mine Operations LLC and (2) Lyonas USA LLC : (1) California and (2) Texas	0.541	0.779	Jul 2020	-		-		-		-	-	-	-
Radar Affordability: Land and Sea	C/FFP	Consortium Management LLC : VA	0.295	0.554	Apr 2020	1.000	Apr 2021	0.610	May 2021	-		0.610	-	-	-
Radar Affordability: Airborne Radars	C/FFP	Systems Innovation Engineering : NJ	0.361	0.125	Aug 2020	-		-		-		-	-	-	-
Silicon Interposer - Congressional Add FY19	C/FFP	JCAMB Inc BRIDGE : Kissimmee, FL	3.275	1.875	Jul 2020	-		-		-		-	-	-	-
Enhanced Manufacturing of Tungsten Carbide Penetrators - Congressional Add - Advanced Armor Piercing	C/FP	do not publish : do not publish	-	9.450	Sep 2020	5.000		-		-		-	-	-	-
Enhanced Manufacturing of Tungsten Carbide Penetrator - Army Support	MIPR	ARDEC : PICATINNY ARSENAL NJ	-	0.900	Apr 2020	-		-		-		-	-	-	-
Automated Textile Manufacturing - Congressional Add	C/FFP	Next Defense Solutions, LLC : NJ	-	6.709	Sep 2020	10.000	May 2021	-		-		-	-	-	-
Automated Textile Manufacturing - Project Management	MIPR	CCDC-Soldier Center and CCDC-AC : MA	-	1.000	Apr 2020	-		-		-		-	-	-	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 7	R-1 Program Element (Number/Name) PE 0607210D8Z / *Industrial Base Analysis and Sustainment Support*	Project (Number/Name) 819 / *Industrial Base Analysis and Sustainment*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Interdisciplinary Center for Advanced Manufacturing Systems - Congressional Add	C/FFP	Auburn University : AL	-	4.268	Aug 2020	7.500	May 2021	-		-		-	-	-	-
Lead-Free Electronics - Congressional Add - Defense Electronics Consortium Management	C/FFP	U.S. Partnership for Assured Electronics : Washington DC	-	3.900	Sep 2020	10.000	May 2021	-		-		-	-	-	-
Machine and Advanced Manufacturing - Congressional Add - Machine Tools	FFRDC	Oakridge National Laboratory : TN	-	13.693	Mar 2020	16.000	May 2021	-		-		-	-	-	-
Machine and Advanced Manufacturing - Congressional Add - Workforce Component	C/FFP	Institute for Advanced Composites : TN	-	3.361	Aug 2020	4.000	May 2021	-		-		-	-	-	-
Manufacturing Engineering - Congressional Add	C/FFP	Vermont Technical College : Vermont	-	7.969	Aug 2020	-		-		-		-	-	-	-
Manufacturing Engineering - Congressional Add - Hyper Velocity Prototype for Welding	C/FFP	Institute for Advanced Learning and RESE : VA	-	0.993	Aug 2020	-		-		-		-	-	-	-
Manufacturing Engineering - Congressional Add - Experiment Station	C/FFP	Texas A&M Engineering : TX	-	0.879	Aug 2020	-		-		-		-	-	-	-
Manufacturing Engineering - Congressional Add - Systems Engineering Technicians	C/FFP	Auburn University : AL	-	0.500	Aug 2020	-		-		-		-	-	-	-
Accelerated Training in Defense Manufacturing - Manufacturing Engineering Congressional Add	C/FFP	Institute for Advanced Learning : VA	-	2.577	Aug 2020	-		-		-		-	-	-	-
Manufacturing Engineering - Congressional Add -	C/FFP	Aeromarc LLC : WI	-	0.031	Aug 2020	-		-		-		-	-	-	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 7	R-1 Program Element (Number/Name) PE 0607210D8Z / *Industrial Base Analysis and Sustainment Support*	Project (Number/Name) 819 / *Industrial Base Analysis and Sustainment*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Electronic Manufacturing and Technical Education															
Precision Optics Manufacturing - Congressional Add	C/FFP	TBD : TBD	-	6.086	Oct 2020	4.000	May 2021	-		-		-	-	-	-
Rare Earth Elements (FY20 is Congressional Add)	C/FFP	TBD : TBD	-	4.043	Apr 2021	-		41.000	Nov 2021	-		41.000	-	-	-
Submarine Workforce Development - Congressional Add	C/FFP	Southeastern New England Defense Industry Assoc : Rhode Island	-	6.822	Aug 2020	20.000	Jun 2021	-		-		-	-	-	-
Mobile Nuclear Reactor Supply Chain Analysis	C/FFP	Lockheed Martin : FL	-	1.170	Sep 2020	-		-		-		-	-	-	-
Project Management Support Costs (multiple efforts) - Congressional Adds	MIPR	multiple/various : multiple/various	-	1.747	Apr 2020	-		-		-		-	-	-	-
Supply Chain Risk Management - Health Supplier Illumination - General Increase Congressional Add	C/FFP	202 Group LLC/ Exiger : Washington DC	-	2.927	Apr 2020	-		-		-		-	-	-	-
Supply Chain Illumination Health Suppliers - General Increase Congressional Add	C/FFP	TBD : TBD	-	3.300	Sep 2020	-		-		-		-	-	-	-
Enterprise Machine Learning Analytics and Professional Services - General Increase Congressional Add	Option/ FFP	Advana : VA	-	0.750	Aug 2020	-		-		-		-	-	-	-
Hypersonics Readiness Study - General Increase Congressional Add	C/FFP	TBD : TBD	-	0.695	Sep 2020	-		-		-		-	-	-	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 7	R-1 Program Element (Number/Name) PE 0607210D8Z / *Industrial Base Analysis and Sustainment Support*	Project (Number/Name) 819 / *Industrial Base Analysis and Sustainment*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Shape Memory Alloys	FFRDC	Oakridge National Laboratory : TN	-	-		5.000	May 2021	-		-		-	-	-	-
Advanced Nanomaterials Manufacturing - Congressional Add	C/FFP	TBD : TBD	-	-		10.000		-		-		-	-	-	-
High Performance Weldable Armor - Congressional Add	C/FFP	TBD : TBD	-	-		5.000		-		-		-	-	-	-
Weldable Ultra Hard Armor - Congressional Add	C/FFP	TBD : TBD	-	-		10.000		-		-		-	-	-	-
Freeze Dried Plasma - Congressional Add	C/FFP	TBD : TBD	-	-		10.000		-		-		-	-	-	-
Frequency Selective Limiters - Congressional Add	C/FFP	TBD : TBD	-	-		5.000		-		-		-	-	-	-
Pilot Mask Technology - Congressional Add	C/FFP	TBD : TBD	-	-		10.000		-		-		-	-	-	-
Munitions Supply Chain Expansion - Congressional Add	C/FFP	TBD : TBD	-	-		2.000		-		-		-	-	-	-
Program Increase - Congressional Add - Workforce Development Efforts	C/FFP	TBD : TBD	-	-		15.000		-		-		-	-	-	-
Advanced Manufacturing Workforce Development - Congressional Add	C/FFP	TBD : TBD	-	-		6.000		-		-		-	-	-	-
Industrial Skills - Congressional Add	C/FFP	TBD : TBD	-	-		3.500		-		-		-	-	-	-
Manufacturing Skills/ Accelerated Industiral Skills Development	C/FFP	TBD : TBD	-	0.986	Dec 2019	3.500		3.386		-		3.386	-	-	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 7	R-1 Program Element (Number/Name) PE 0607210D8Z / *Industrial Base Analysis and Sustainment Support*	Project (Number/Name) 819 / *Industrial Base Analysis and Sustainment*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Supply Chain Analysis - Workforce Ship Sector	C/FFP	Poplicus Inc/Govini : VA	-	0.600	Dec 2020	-		-		-		-	-	-	-
Active Matrix Organic Light Emitting Diode	C/FFP	TBD : TBD	-	-		5.000		-		-		-	-	-	-
		Subtotal	115.946	89.880		167.856		45.346		-		45.346	-	-	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FY 2020 Congressional Add efforts: Cornerstone 1% contracting and admin fee	MIPR	Army Contracting Command Rock Island : ILL	-	0.560	Mar 2020	-		-		-		-	-	-	-
		Subtotal	-	0.560		-		-		-		-	-	-	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
OSD SETA support plus Army/Navy Program Management support	Various	various : various	9.947	5.364	Sep 2019	4.166	Sep 2020	4.593	Oct 2021	-		4.593	-	-	-
ODASD(Industrial Policy) Finance and Budget Support	C/T&M	Interactive Process Technology : VA	-	0.286	Jun 2020	-		-		-		-	-	-	-
ODASD(Industrial Policy) Senior Executive Service	C/T&M	SMA : VA	-	0.822	Sep 2020	-		-		-		-	-	-	-
ODASD(Industrial Policy) Program Support	Option/ T&M	UGroup LLC : VA	-	1.000	Aug 2020	-		-		-		-	-	-	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 7	R-1 Program Element (Number/Name) PE 0607210D8Z / *Industrial Base Analysis and Sustainment Support*	Project (Number/Name) 819 / *Industrial Base Analysis and Sustainment*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
OUSD(A&S) Admin and Analytical Support Services	Option/ T&M	Logistics Management Institute : VA	-	3.593	Apr 2020	-		-		-		-	-	-	-
Joint Army NASA Air Force (JANNAF) Executive Committee Support	C/FFP	Johns Hopkins : MD	0.250	0.255	Sep 2020	0.123	Sep 2021	0.250		-		0.250	-	-	-
		Subtotal	10.197	11.320		4.289		4.843		-		4.843	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	126.143	101.760		172.145		50.189		-		50.189	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 7	**R-1 Program Element (Number/Name)** PE 0607210D8Z / *Industrial Base Analysis and Sustainment Support*	**Project (Number/Name)** 819 / *Industrial Base Analysis and Sustainment*



Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 7	**R-1 Program Element (Number/Name)** PE 0607210D8Z / *Industrial Base Analysis and Sustainment Support*	**Project (Number/Name)** 819 / *Industrial Base Analysis and Sustainment*

	FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025				FY 2026			
	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
Planning in Progress							[redacted]																					

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 7	**R-1 Program Element (Number/Name)** PE 0607210D8Z / *Industrial Base Analysis and Sustainment Support*	**Project (Number/Name)** 819 / *Industrial Base Analysis and Sustainment*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
All Sectors				
Boron Carbide - US Sourcing	1	2020	4	2021
Directed Energy Supply Chain Assurance	1	2020	4	2022
Heavy Rare Earth Elements Supply Chain Resiliency	1	2020	4	2025
Industrial Skills Development and Acceleration	1	2020	4	2025
Manufacturing Skills Challenge	1	2020	4	2023
Radar Affordability	1	2020	4	2025
Congressional Adds FY 2020				
Automated Textile Manufacturing	4	2020	3	2023
Enhanced Manufacturing of Tungsten Carbide Penetrators	4	2020	3	2023
Interdisciplinary Center for Advanced Manufacturing Systems	4	2020	4	2022
Lead-Free Electronics	4	2020	3	2023
Machine and Advanced Manufacturing	2	2020	3	2023
Manufacturing Engineering - Hyper Velocity Prototype for Welding	4	2020	4	2021
Manufacturing Engineering - Experiment Station, Engineering Technicians, Electronic Mfg & Technical Education	4	2020	4	2024
Precision Optics Manufacturing	1	2021	3	2023
Rare Earth Elements from Coal Ash	1	2021	3	2023
Submarine Workforce Development	4	2020	4	2022
FY 2021 Congressional Adds				
Planning in Progress	3	2021	3	2024

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 7	R-1 Program Element (Number/Name) PE 0607210D8Z / *Industrial Base Analysis and Sustainment Support*	Project (Number/Name) 821 / *Microelectronics*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
821: *Microelectronics*	-	0.000	0.000	8.000	-	8.000	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

FY 2022 new start to support Defense Microelectronics Cross-Functional Team.

A. Mission Description and Budget Item Justification

Microelectronics components are the foundation of modern military systems. The Department of Defense (DoD) is exposed to various vulnerabilities that threaten the ability to source microelectronics needed to sustain programs of record. In order to prepare the Department for Great Power Competition, the DoD must take action to ensure access to the microelectronic components needed to sustain our defense programs and systems effectively and affordably. The Department also needs a better strategy to transition leading edge technology developed by both government and industry to DoD programs of record, to ensure the Department maintains a competitive edge.

As part of the response to Executive Order 13806, "Assessing and Strengthening the Manufacturing and Defense Industrial Base and Supply Chain Resiliency of the United States," July 21, 2017, the Office of the Under Secretary of Defense for Acquisition and Sustainment (OUSD(A&S)) undertook a study of the global microelectronics industry, the state of the defense microelectronics supply chain, and the Department's ability to sustain programs of record. The study revealed the domestic microelectronics industry is shrinking, with the United States consuming 34 percent of global demand and producing less than 12 percent of supply. The DoD:

• is heavily reliant on microelectronics produced in foreign countries or by firms coming increasingly under the influence of foreign adversaries. A large number of these parts are present in many key DoD systems;
• has very poor supply chain visibility;
• could find critical components needed to sustain or build programs of record unavailable due to a conflict, embargo, or natural disaster due to the reliance foreign parts; and
• has few sources of the radiation-hardened microelectronics and limited radiation test facilities resources needed by systems for nuclear modernization, our highest priority.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Microelectronics Cross Functional Team	-	-	8.000
Description: A Cross-Functional Team (CFT) was established effective January 2021 to develop a DoD strategy and implementation and transition plan to minimize vulnerabilities within the Department's microelectronic supply chain. The transition plan will be comprehensive, and include a budget plan. The CFT will function as an advisory body to the Deputy Secretary of Defense, the Under Secretary of Defense for Acquisition and Sustainment (USD(A&S)), and the Under Secretary of Defense			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 7	**R-1 Program Element (Number/Name)** PE 0607210D8Z / *Industrial Base Analysis and Sustainment Support*	**Project (Number/Name)** 821 / *Microelectronics*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
for Research and Engineering (USD(R&E)) in order to strengthen the domestic microelectronics Defense Industrial Base and to develop and transition leading-edge microelectronics technology into DoD systems to prepare the Department for Great Power Competition. ***FY 2022 Plans:*** The CFT was established in January 2021 by detailing subject matter experts from the Services to the CFT, and executed contracts for studies to supply the analysis necessary to inform the DoD strategy development. In FY 2022, the CFT will continue to develop the DoD strategy, and develop a roadmap to execute, which includes funding, policy, and legislation to ensure the strategy is successfully executed. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Funding increase FY 2021 to FY 2022 was funded via realignment within DoD RDT&E resources to support the success of the Cross-Functional team established by SECDEF direction.			
Accomplishments/Planned Programs Subtotals	-	-	8.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 7	R-1 Program Element (Number/Name) PE 0607210D8Z / *Industrial Base Analysis and Sustainment Support*	Project (Number/Name) 821 / *Microelectronics*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Public Private Partnership Study	C/BPA	CTC Aero : Port Jefferson, NY	-	-		-		0.500	Dec 2021	-		0.500	-	-	-
Strategic Initiatives Assessment	C/BPA	Boston Consulting Group : Boston, MA	-	-		-		0.500	Dec 2021	-		0.500	-	-	-
Microelectronics Policy Assessment	C/BPA	Potomac Institute : Arlington, VA	-	-		-		0.500	Dec 2021	-		0.500	-	-	-
		Subtotal	-	-		-		1.500		-		1.500	-	-	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Reimburse Program Management Support from Various DoD Organizations	MIPR	Various : Various	-	-		-		2.500	Dec 2021	-		2.500	-	-	-
SETA Program Management Support via FFRDC	FFRDC	Various : Various	-	-		-		1.000	Dec 2021	-		1.000	-	-	-
SETA Program Management Support Contract	C/CPFF	Various : Various	-	-		-		3.000		-		3.000	-	-	-
		Subtotal	-	-		-		6.500		-		6.500	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		0.000		8.000		-		8.000	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 7	**R-1 Program Element (Number/Name)** PE 0607210D8Z / *Industrial Base Analysis and Sustainment Support*	**Project (Number/Name)** 821 / *Microelectronics*

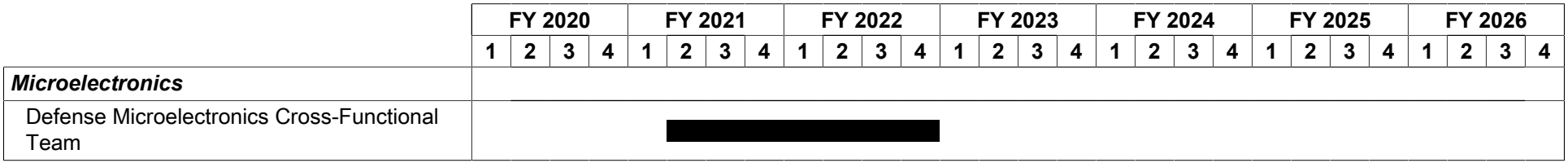


Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 7	**R-1 Program Element (Number/Name)** PE 0607210D8Z / *Industrial Base Analysis and Sustainment Support*	**Project (Number/Name)** 821 / *Microelectronics*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Microelectronics				
Defense Microelectronics Cross-Functional Team	2	2021	4	2022

THIS PAGE INTENTIONALLY LEFT BLANK

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 0607310D8Z / *CWMD Systems: Operational Systems Development*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	23.225	12.268	16.954	18.721	-	18.721	-	-	-	-	-	-
242: *CWMD Systems: Operational System Development*	23.225	12.268	16.954	18.721	-	18.721	-	-	-	-	-	-

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 exploit and defeat 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 validated 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 and their delivery systems.

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 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 0607310D8Z *I CWMD Systems: Operational Systems Development*

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	12.734	19.082	19.288	-	19.288
Current President's Budget	12.268	16.954	18.721	-	18.721
Total Adjustments	-0.466	-2.128	-0.567	-	-0.567
• Congressional General Reductions	-	-2.128			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Program Adjustments	-0.466	-	-0.567	-	-0.567

Change Summary Explanation

Minor program adjustments.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 7	R-1 Program Element (Number/Name) PE 0607310D8Z / *CWMD Systems: Operational Systems Development*	Project (Number/Name) 242 / *CWMD Systems: Operational System Development*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
242: *CWMD Systems: Operational System Development*	23.225	12.268	16.954	18.721	-	18.721	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

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 exploit and defeat 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 validated 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 and their delivery systems.

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.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: P*242 / CWMD Systems: Operational Systems Development	12.268	16.954	18.721
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			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 7	**R-1 Program Element (Number/Name)** PE 0607310D8Z / *CWMD Systems: Operational Systems Development*	**Project (Number/Name)** 242 / *CWMD Systems: Operational System Development*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
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 and their delivery systems. ***FY 2021 Plans:*** • Transition the Counterproliferation Advanced Analytics Cell capability to a US Special Operations Command component command. • Develop and deliver two enhanced detection capabilities supporting the Air Force Technical Applications Center (AFTAC). • Transition a WMD intelligence application to the Defense Intelligence Agency for utilization across the CWMD community. • Develop and deliver enhancements and upgrades for fielded classified CWMD operational capabilities to DoD Components. Capability gaps not addressed in FY 2021 due to budget adjustments are candidates for inclusion in FY 2022 plans. ***FY 2022 Plans:*** • Enhance Service and Combatant Command capabilities to detect, disable, or defeat WMD. • Upgrade & enhance DoD capabilities to counter WMD proliferation. • Enhance AFTAC capabilities to support nuclear treaty monitoring and nuclear event detection. • Upgrade or enhance fielded systems for the Joint Force to detect, disrupt, and defeat WMD and WMD networks. Projects are classified. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The increase in FY 2022 is representative of internal realignment of funds within the department for National Defense Strategy priorities.			
Accomplishments/Planned Programs Subtotals	12.268	16.954	18.721

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

N/A

D. Acquisition Strategy

The Office of the Deputy Assistant Secretary of Defense for Threat Reduction and Arms Control (ODASD(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

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 7	**R-1 Program Element (Number/Name)** PE 0607310D8Z / *CWMD Systems: Operational Systems Development*	**Project (Number/Name)** 242 / *CWMD Systems: Operational System Development*

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 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 7	**R-1 Program Element (Number/Name)** PE 0607310D8Z / *CWMD Systems: Operational Systems Development*	**Project (Number/Name)** 242 / *CWMD Systems: Operational System Development*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Upgrade & enhance Special Operations Forces (SOF) CWMD capabilities	MIPR	USSOCOM : TBD	3.634	4.089	Jan 2020	5.651	Jan 2021	8.424	Jan 2022	-		8.424	-	-	-
Enhance Service capabilities to detect, disable, or defeat WMD	Various	TBD : TBD	3.633	4.089	Feb 2020	5.651	Feb 2021	2.995	Jan 2022	-		2.995	-	-	-
Enhance Air Force Technical Applications Center (AFTAC) capabilities to support nuclear treaty monitoring and nuclear event detection	MIPR	AFTAC : TBD	3.634	4.090	Jan 2020	5.652	Jan 2021	3.370	Jan 2022	-		3.370	-	-	-
Upgrade fielded CWMD Systems	Various	Various : Various	12.324	-		-		3.932	Jan 2022	-		3.932	-	-	-
		Subtotal	23.225	12.268		16.954		18.721		-		18.721	-	-	N/A

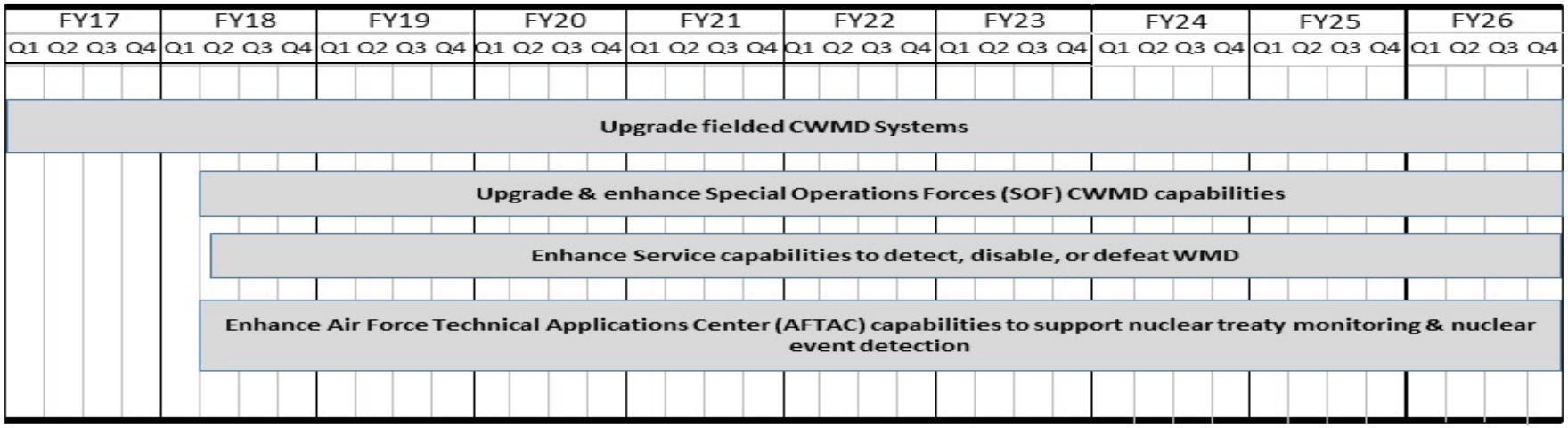
	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	23.225	12.268		16.954		18.721		-		18.721	-	-	N/A

Remarks

N/A.

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 7	**R-1 Program Element (Number/Name)** PE 0607310D8Z / *CWMD Systems: Operational Systems Development*	**Project (Number/Name)** 242 / *CWMD Systems: Operational System Development*

CWMD Systems: Operational System Development
BA 7 / PE 0607310D8Z



THIS PAGE INTENTIONALLY LEFT BLANK

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 0303140D8Z / *Information Systems Security Program*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	75.428	51.876	46.529	49.191	-	49.191	-	-	-	-	-	-
140: *Information Systems Security Program*	75.428	51.876	46.529	49.191	-	49.191	-	-	-	-	-	-
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 supports 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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	67.631	46.577	50.010	-	50.010
Current President's Budget	51.876	46.529	49.191	-	49.191
Total Adjustments	-15.755	-0.048	-0.819	-	-0.819
• Congressional General Reductions	-	-0.048			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-15.755	-			
• SBIR/STTR Transfer	-	-			
• Program Adjustment	-	-	-0.819	-	-0.819

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 0303140D8Z / *Information Systems Security Program*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Information Systems Security Program Plans and Accomplishments	51.876	46.529	49.191
FY 2021 Plans: • 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. • 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. • 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. • 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. • 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. • 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. • 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). • 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			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 0303140D8Z / *Information Systems Security Program*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
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. • 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. • 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. ***FY 2022 Plans:*** • 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. • 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. • 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. • 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. • 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. • 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			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 0303140D8Z / *Information Systems Security Program*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
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. • 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). • 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. • 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. • 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. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increase due to change in classified program level of effort.			
Accomplishments/Planned Programs Subtotals	51.876	46.529	49.191

D. Other Program Funding Summary ($ in Millions)

Line Item	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
• PE 0303140D8Z O&M DW: *Information System Security Program*	20.281	14.985	16.263	-	16.263	-	-	-	-	-	-

Remarks

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 0303140D8Z / *Information Systems Security Program*

E. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 7	**R-1 Program Element (Number/Name)** PE 0303140D8Z / *Information Systems Security Program*	**Project (Number/Name)** 140 / *Information Systems Security Program*

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Studies and Analysis	Option/ Various	Various : Various	3.603	1.962	Jul 2020	1.962	Jul 2021	-		-		-	Continuing	Continuing	-
Technical Engineering Services	Option/ Various	Various : Various	29.737	40.245	Jul 2020	35.222	Jul 2021	40.614	Jul 2022	-		40.614	Continuing	Continuing	-
Services Support	Option/ Various	Various : Various	21.086	0.194	Jul 2020	0.194	Jul 2021	-		-		-	Continuing	Continuing	-
		Subtotal	54.426	42.401		37.378		40.614		-		40.614	Continuing	Continuing	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management Support	Option/ Various	Various : Various	1.836	0.394	Jul 2020	0.394	Jul 2021	8.577	Jul 2022	-		8.577	Continuing	Continuing	-
Engineering Support	Option/ Various	Various : Various	12.820	6.923	Jul 2020	6.599	Jul 2021	-		-		-	Continuing	Continuing	-
Research & Development	Option/ Various	Various : Various	6.346	2.158	Jul 2020	2.158	Jul 2021	-		-		-	Continuing	Continuing	-
		Subtotal	21.002	9.475		9.151		8.577		-		8.577	Continuing	Continuing	N/A

Remarks

NA

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	75.428	51.876		46.529		49.191		-		49.191	Continuing	Continuing	N/A

Remarks

NA

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 7	**R-1 Program Element (Number/Name)** PE 0303140D8Z / *Information Systems Security Program*	**Project (Number/Name)** 140 / *Information Systems Security Program*

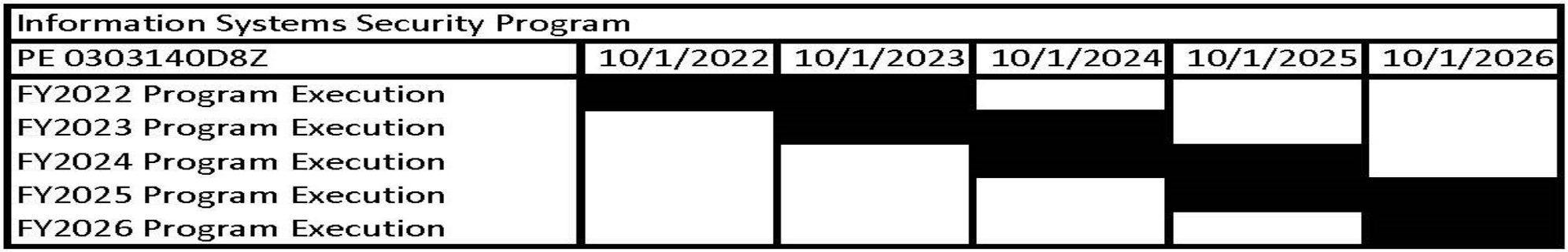


Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 7	**R-1 Program Element (Number/Name)** PE 0303140D8Z / *Information Systems Security Program*	**Project (Number/Name)** 140 / *Information Systems Security Program*

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	3	2022	2	2023
FY 2023 Projected Execution	3	2023	2	2024
FY 2024 Projected Execution	3	2024	2	2025
FY2025 Projected Execution	3	2025	2	2026
FY2026 Project Execution	3	2026	4	2026

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 0305186D8Z / *Policy R&D Programs*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	42.283	6.231	6.291	4.843	-	4.843	-	-	-	-	-	-
186: *Policy R&D Programs*	42.283	6.231	6.291	4.843	-	4.843	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

The Policy R&D Program supports the National Defense Strategy by providing 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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	6.301	7.144	7.329	-	7.329
Current President's Budget	6.231	6.291	4.843	-	4.843
Total Adjustments	-0.070	-0.853	-2.486	-	-2.486
• Congressional General Reductions	-	-0.853			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Program Adjustment	-0.070	-	-2.486	-	-2.486

Change Summary Explanation

The FY 2022 funding request was reduced by $2.334 million to account for the availability of prior year execution balances.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 7	R-1 Program Element (Number/Name) PE 0305186D8Z / *Policy R&D Programs*	Project (Number/Name) 186 / *Policy R&D Programs*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
186: *Policy R&D Programs*	42.283	6.231	6.291	4.843	-	4.843	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

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 2020	FY 2021	FY 2022
Title: Future Security Challenges	2.643	2.000	1.583

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 2021 Plans:

. Perform ongoing trend analysis and develop mitigation options for addressing program risks with increased emphasis on the INDO-PACOM AOR.
• Develop opportunities to apply risk management methodologies to identified program areas.
• 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
• 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
• Continue to enhance strategies and relationships with European nations based on the exchange of information through education opportunities and existing policies
• Research and analyze particular Far (China) 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.
• Continue research efforts within the Services and Combatant Commands to better analyze and demonstrate enduring counterinsurgency operational capabilities.

FY 2022 Plans:

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 7	**R-1 Program Element (Number/Name)** PE 0305186D8Z / *Policy R&D Programs*	**Project (Number/Name)** 186 / *Policy R&D Programs*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Continue efforts to include: Perform ongoing trend analysis and develop mitigation options for addressing program risks with increased emphasis on the INDO-PACOM AOR. • Develop opportunities to apply risk management methodologies to identified program areas. • 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 • 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 • Continue to enhance strategies and relationships with European nations based on the exchange of information through education opportunities and existing policies • Research and analyze particular Far (China) 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. • Continue research efforts within the Services and Combatant Commands to better analyze and demonstrate enduring counterinsurgency operational capabilities. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The FY 2022 funding request was reduced to account for the availability of prior year execution balances.			
Title: Long Term Competitions (LTC) Program ***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 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. ***FY 2021 Plans:***	2.888	3.591	2.560

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 7	**R-1 Program Element (Number/Name)** PE 0305186D8Z / *Policy R&D Programs*	**Project (Number/Name)** 186 / *Policy R&D Programs*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Specific efforts are classified. ***FY 2022 Plans:*** Specific efforts are classified. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The FY 2022 funding request was reduced to account for the availability of prior year execution balances.			
Title: Defense Planning Scenarios Activities ***Description:*** This program is classified. ***FY 2021 Plans:*** Specific efforts are classified. ***FY 2022 Plans:*** Specific efforts are classified. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** No change to planned costs.	0.700	0.700	0.700
Accomplishments/Planned Programs Subtotals	6.231	6.291	4.843

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 7	R-1 Program Element (Number/Name) PE 0305186D8Z / *Policy R&D Programs*	Project (Number/Name) 186 / *Policy R&D Programs*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Policy R&D Programs	Various	National Defense Univ, FFRDCs : Various	42.283	6.231		6.291		4.843		-		4.843	Continuing	Continuing	N/A
		Subtotal	42.283	6.231		6.291		4.843		-		4.843	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 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	42.283	6.231		6.291		4.843		-		4.843	Continuing	Continuing	N/A

Remarks

NA

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 7	**R-1 Program Element (Number/Name)** PE 0305186D8Z / *Policy R&D Programs*	**Project (Number/Name)** 186 / *Policy R&D Programs*

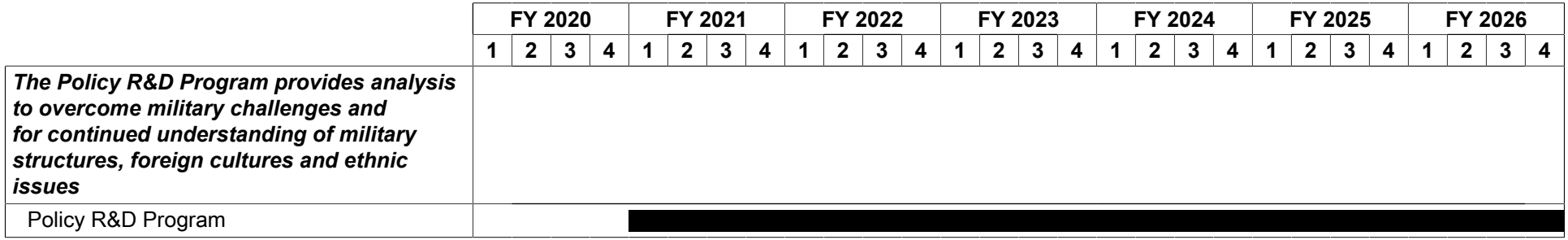


Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 7	**R-1 Program Element (Number/Name)** PE 0305186D8Z / *Policy R&D Programs*	**Project (Number/Name)** 186 / *Policy R&D Programs*

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	2021	4	2026

THIS PAGE INTENTIONALLY LEFT BLANK

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 0305199D8Z / *Net Centricity*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	108.124	22.400	21.793	13.471	-	13.471	-	-	-	-	-	-
199: *GIG Evaluation Facilities (GIG-EF) and GIG Enterprise-Wide Systems Engineering Advisory Activities*	108.124	22.400	21.793	13.471	-	13.471	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Net Centricity program provides 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, electromagnetic spectrum integration and agile electromagnetic spectrum operations, 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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	21.384	21.793	17.708	-	17.708
Current President's Budget	22.400	21.793	13.471	-	13.471
Total Adjustments	1.016	0.000	-4.237	-	-4.237
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	1.811	-			
• SBIR/STTR Transfer	-0.795	-			
• Program Adjustment	-	-	-4.237	-	-4.237

Change Summary Explanation

The FY 2022 funding request was reduced by $4.913 million to account for the availability of prior year execution balances.

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Net Centricity Plans and Accomplishments	22.400	21.793	13.471
FY 2021 Plans: – Continue technical assessment/refine commercial wireless policy guidance to support CMD strategy implementation; continue assessments of the effects of cybersecurity policies.			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 0305199D8Z / *Net Centricity*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
– 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. – Continue implementation assessments to refine mobile application and device strategies. – Review/refine mobile application approval process guides, DoD Mobile PKI guides, and procedure for the Electronic Flight Bag (EFB). – Development of an analytical model that facilitates rapid, safe, and operationally adequate access to the 1030/1090MHz spectrum. – Continue technical and business case analyses for Commercial mobile devices and voice encryption. – Update the Radio and Communication Security modernization plan for tactical radios. Assess Service implementation. – Continue analysis to update the CJTF Architecture to reflect Component C4II capability plans. – Continue development of interoperable Land Mobile Radio (LMR) standards to support public safety communications. – Continue analysis to of LMR policy implementation; refine procedures to support LMR implementation in the DoD. – Continue analysis of Waveform Development and Management in the DoD. – Continue analysis to maintain authoritative list of DoD-approved waveforms and supporting repository to maintain waveform baseline. – 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. – Continue technical analysis and support for Protected, Wideband, Narrowband, and Commercial SATCOM. Assess strategy alignment. – Update SATCOM Synchronization Architectures for Protected, Wideband, Narrowband and Commercial SATCOM capabilities. – Continue compliance reviews of select programs; identify shortfalls in program bandwidth supportability planning and analysis and provide recommendations for corrective action. – Continue efforts to implement SATCOM Gateway Right-sizing approaches to optimize SATCOM gateways across the defense enterprise. – Continue technical/requirements analysis and feasibility assessments for implementing legacy narrowband solutions for MUOS payload. – Continue analysis to support implementation approaches for JIPM alternatives. – Conduct follow-on analysis in support of the Protected SATCOM AoA recommendations and preferred alternative. – Continue support for the WCS AOA and follow-on analysis. – Continue technical analysis to improve DoD utilization of Commercial SATCOM capabilities. – 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. – 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.			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 0305199D8Z / *Net Centricity*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
– Continue technical analysis of selected joint and Service C2 programs/initiatives to promote enterprise approaches for data and services. – Continue technical analysis for the implementation of Common Mission Network Transport (CMNT) capability. – Continue technical analysis of MNIS programs and initiatives, related acquisition strategies, and functional requirements. – Continue analyses to address adoption and evolution of mission services as candidate enterprise services for the JIE. – Conduct follow-on analysis to inform implementation of the EoA recommendations for the GCCS Family of Systems. – 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. – 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. – Continue wireless architecture and advanced technologies analysis to inform Department-wide policies and implementation of mobility solutions. – Continue technical analysis to support compliance oversight of waveform policies and technical profile specifications. – Continue efforts to refine communications policies and analysis technologies applicable to commercial mobile devices. – Continue DoD Commercial Mobility implementation and systems engineering analysis Defense Mobile Unclassified and Classified Capabilities (DMUC/DMCC). – Continue analysis to support DMUC derived credentials implementation. – Continue analysis of 5G technology for DoD tactical use. – Develop 5G standards engagement plan. – Continue technical analysis for Network Management (NM) interoperability, architecture and data artifacts. – Continue systems engineering and architecture analysis for JIE tactical processing nodes (TPNs). – Continue analysis to address implementation of TSVSIC for tactical radios. – 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. – Continue technical analysis to support implementation of the network management strategy and roadmap. – Continue development of data ontologies and NIEM compliant IEPDs for network management. – Continue technical analysis in support of C3 policies, plans, studies, roadmaps, and capability assessments. – Continue end-to-end analysis of the SATCOM environment; support technical evaluations of end-to-end capabilities. – Continue studies and analysis in support of the DoD CIO's Mobile Device Strategy and Mobile Device Security Efforts. – Continue Hub-Based HF Communications Concept to provide protected high rate communications needed for long range connectivity in satellite-denied environments – Continue Wideband SATCOM AoA user demand projections develop planning decks and scenario guidance with Joint Staff/J6 coordinated scenarios description paper and CAPE concurrence.			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 0305199D8Z / *Net Centricity*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
– Continue oversight of Positioning, Navigation and Timing efforts and capability development through PNT Oversight Council and associated working groups. – 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. – Continue support for Interagency PNT efforts, including outreach, advocacy, and education. – Continue to lead development efforts of the annual Federal Radionavigation Plan (FRP). – Continue to provide secretariat support for the PNT Oversight Council, PNT Executive Management Board, and to lead associated PNT and navigation warfare working groups. – Continue to provide secretariat support to the C5 Leadership Board. – Continue PNT Trilateral MOA development (DoD, DOT, DHS) efforts. – Continue precise time dissemination Trilateral MOA (DoD, DoC, DHS) efforts. – Continue development of the roadmap for fielding Modernized GPS User equipment (MGUE). – Continue oversight and direction of efforts to develop and field resilient software assurance measures for MGUE. – Continue support for Multi-GNSS policy development. – Continue support and leadership role in NATO CaP2 efforts. – Continue to support secure voice interoperability and desires to drive planning for UHF anti-jam (SATURN) planning through NATO channels. – 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. – Continue technical analysis to support implementation of JIE capability upgrades and technical planning. – Continue studies and analysis to progress of JIE technical implementation actions. – Continue technical analysis and studies related to SDN as an approach to network normalization and security. – 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. – Continue technical and policy assessments to enable TDL migration. – Continue efforts to finalize Joint MIL-SPEC for CDL and initiate documentation for MADL in coordination with JSF team. – 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. – Assess developing waveform technologies for improving the robustness and scalability of current TDL networks. – 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. – 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.			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 0305199D8Z / *Net Centricity*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
– 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. – Continue efforts to evaluate and implement acquisition strategies for U.S. support to NATO SATCOM. – Continue technical analysis and facilitate execution of the SATCOM Systems Engineering Group (SSEG). – Continue efforts to review, assess, and process DISN Tech Refresh plans for CIO approval. – Coordinate, facilitate, and record DISN Quarterly reviews to assessed progress and issues in transport and network infrastructure, unified capabilities and network management. – Continue efforts to maintain JIE Infrastructure Framework and synchronization roadmap to track infrastructure deployment or implementation. – Continue acquisition like review of JIE objectives, plans, technical approaches, schedules and cost factors to support technical reviews of JIE implementation. – Support the development of business case activities as required. 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 2022 Plans: – Continue technical assessment/refine commercial wireless policy guidance to support CMD strategy implementation; continue assessments of the effects of cybersecurity policies. – 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. – Continue implementation assessments to refine mobile application and device strategies. – Review/refine mobile application approval process guides, DoD Mobile PKI guides, and procedure for the Electronic Flight Bag (EFB). – Development of an analytical model that facilitates rapid, safe, and operationally adequate access to the 1030/1090MHz spectrum. – Modernize DoD's spectrum dependent systems to a fully integrated information and decision support architecture for all-domain maneuver and fires superiority. – Modernize spectrum data, data collection, storage retrieval, and aggregation. – Develop AI-enabled spectrum data analytics. – Modernize Electromagnetic Battle Management, Situational Awareness and C2 integration. – Continue 5G experimentation for dynamic, bidirectional, cognitive spectrum sharing. – Continue technical and business case analyses for Commercial mobile devices and voice encryption.			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 0305199D8Z / *Net Centricity*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
– Update the Radio and Communication Security modernization plan for tactical radios. Assess Service implementation. – Continue analysis to update the CJTF Architecture to reflect Component C4II capability plans. – Continue development of interoperable Land Mobile Radio (LMR) standards to support public safety communications. – Continue analysis to of LMR policy implementation; refine procedures to support LMR implementation in the DoD. – Continue analysis of Waveform Development and Management in the DoD. – Continue analysis to maintain authoritative list of DoD-approved waveforms and supporting repository to maintain waveform baseline. – 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. – Continue technical analysis and support for Protected, Wideband, Narrowband, and Commercial SATCOM. Assess strategy alignment. – Update SATCOM Synchronization Architectures for Protected, Wideband, Narrowband and Commercial SATCOM capabilities. – Continue compliance reviews of select programs; identify shortfalls in program bandwidth supportability planning and analysis and provide recommendations for corrective action. – Continue efforts to implement SATCOM Gateway Right-sizing approaches to optimize SATCOM gateways across the defense enterprise. – Continue technical/requirements analysis and feasibility assessments for implementing legacy narrowband solutions for MUOS payload. – Continue analysis to support implementation approaches for JIPM alternatives. – Conduct follow-on analysis in support of the Protected SATCOM AoA recommendations and preferred alternative. – Continue support for the WCS AOA and follow-on analysis. – Continue technical analysis to improve DoD utilization of Commercial SATCOM capabilities. – 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. – 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. – Continue technical analysis of selected joint and Service C2 programs/initiatives to promote enterprise approaches for data and services. – Continue technical analysis for the implementation of Common Mission Network Transport (CMNT) capability. – Continue technical analysis of MNIS programs and initiatives, related acquisition strategies, and functional requirements. – Continue analyses to address adoption and evolution of mission services as candidate enterprise services for the JIE. – Conduct follow-on analysis to inform implementation of the EoA recommendations for the GCCS Family of Systems. – 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.			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 0305199D8Z / *Net Centricity*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
– 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. – Continue wireless architecture and advanced technologies analysis to inform Department-wide policies and implementation of mobility solutions. – Continue technical analysis to support compliance oversight of waveform policies and technical profile specifications. – Continue efforts to refine communications policies and analysis technologies applicable to commercial mobile devices. – Continue DoD Commercial Mobility implementation and systems engineering analysis Defense Mobile Unclassified and Classified Capabilities (DMUC/DMCC). – Continue analysis to support DMUC derived credentials implementation. – Continue analysis of 5G technology for DoD tactical use. – Develop 5G standards engagement plan. – Continue technical analysis for Network Management (NM) interoperability, architecture and data artifacts. – Continue systems engineering and architecture analysis for JIE tactical processing nodes (TPNs). – Continue analysis to address implementation of TSVSIC for tactical radios. – 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. – Continue technical analysis to support implementation of the network management strategy and roadmap. – Continue development of data ontologies and NIEM compliant IEPDs for network management. – Continue technical analysis in support of C3 policies, plans, studies, roadmaps, and capability assessments. – Continue end-to-end analysis of the SATCOM environment; support technical evaluations of end-to-end capabilities. – Continue studies and analysis in support of the DoD CIO's Mobile Device Strategy and Mobile Device Security Efforts. – Continue Hub-Based HF Communications Concept to provide protected high rate communications needed for long range connectivity in satellite-denied environments – Continue Wideband SATCOM AoA user demand projections develop planning decks and scenario guidance with Joint Staff/J6 coordinated scenarios description paper and CAPE concurrence. – Continue oversight of Positioning, Navigation and Timing efforts and capability development through PNT Oversight Council and associated working groups. – 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. – Continue support for Interagency PNT efforts, including outreach, advocacy, and education. – Continue to lead development efforts of the annual Federal Radionavigation Plan (FRP). – Continue to provide secretariat support for the PNT Oversight Council, PNT Executive Management Board, and to lead associated PNT and navigation warfare working groups. – Continue to provide secretariat support to the C5 Leadership Board.			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 0305199D8Z / *Net Centricity*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
– Continue PNT Trilateral MOA development (DoD, DOT, DHS) efforts. – Continue precise time dissemination Trilateral MOA (DoD, DoC, DHS) efforts. – Continue development of the roadmap for fielding Modernized GPS User equipment (MGUE). – Continue oversight and direction of efforts to develop and field resilient software assurance measures for MGUE. – Continue support for Multi-GNSS policy development. – Continue support and leadership role in NATO CaP2 efforts. – Continue to support secure voice interoperability and desires to drive planning for UHF anti-jam (SATURN) planning through NATO channels. – 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. – Continue technical analysis to support implementation of JIE capability upgrades and technical planning. – Continue studies and analysis to progress of JIE technical implementation actions. – Continue technical analysis and studies related to SDN as an approach to network normalization and security. – 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. – Continue technical and policy assessments to enable TDL migration. – Continue efforts to finalize Joint MIL-SPEC for CDL and initiate documentation for MADL in coordination with JSF team. – 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. – Assess developing waveform technologies for improving the robustness and scalability of current TDL networks. – 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. – 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. – 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. – Continue efforts to evaluate and implement acquisition strategies for U.S. support to NATO SATCOM. – Continue technical analysis and facilitate execution of the SATCOM Systems Engineering Group (SSEG). – Continue efforts to review, assess, and process DISN Tech Refresh plans for CIO approval. – 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 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 0305199D8Z / *Net Centricity*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
– Continue efforts to maintain JIE Infrastructure Framework and synchronization roadmap to track infrastructure deployment or implementation. – Continue acquisition like review of JIE objectives, plans, technical approaches, schedules and cost factors to support technical reviews of JIE implementation. – Support the development of business case activities as required. 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 to FY 2022 Increase/Decrease Statement:*** The FY 2022 funding request was reduced by $4.913 million to account for the availability of prior year execution balances.			
Accomplishments/Planned Programs Subtotals	22.400	21.793	13.471

D. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Starting in FY 2022, PE 0303191D8Z Joint Electromagnetic Technology (JET) Program transfers to PE 0305199D8Z Net Centricity.

E. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 7	**R-1 Program Element (Number/Name)** PE 0305199D8Z / *Net Centricity*	**Project (Number/Name)** 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 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Studies and Analysis	Various	Various : Various	18.604	6.130	Jul 2020	4.747	Jul 2021	0.829	Jul 2022	-		0.829	Continuing	Continuing	Continuing
Technical Engineering Services	Various	Various : Various	50.709	1.000	Jul 2020	1.000	Jul 2021	4.389	Jul 2022	-		4.389	Continuing	Continuing	Continuing
		Subtotal	69.313	7.130		5.747		5.218		-		5.218	Continuing	Continuing	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management Support	Various	Various : Various	18.677	5.679	Jul 2020	4.480	Jul 2021	6.403	Jul 2022	-		6.403	Continuing	Continuing	Continuing
Program Support	FFRDC	Various : Various	1.689	1.114	Jul 2020	0.066	Jul 2021	-		-		-	Continuing	Continuing	Continuing
Engineering Support	FFRDC	Various : Various	14.478	5.811	Jul 2020	9.000	Jul 2012	1.850	Jul 2020	-		1.850	Continuing	Continuing	Continuing
R&D Support	Various	Various : Various	3.967	2.666	Jul 2020	2.500	Jul 2021	-		-		-	Continuing	Continuing	Continuing
		Subtotal	38.811	15.270		16.046		8.253		-		8.253	Continuing	Continuing	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	108.124	22.400		21.793		13.471		-		13.471	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 7	**R-1 Program Element (Number/Name)** PE 0305199D8Z / *Net Centricity*	**Project (Number/Name)** 199 / *GIG Evaluation Facilities (GIG-EF) and GIG Enterprise-Wide Systems Engineering Advisory Activities*

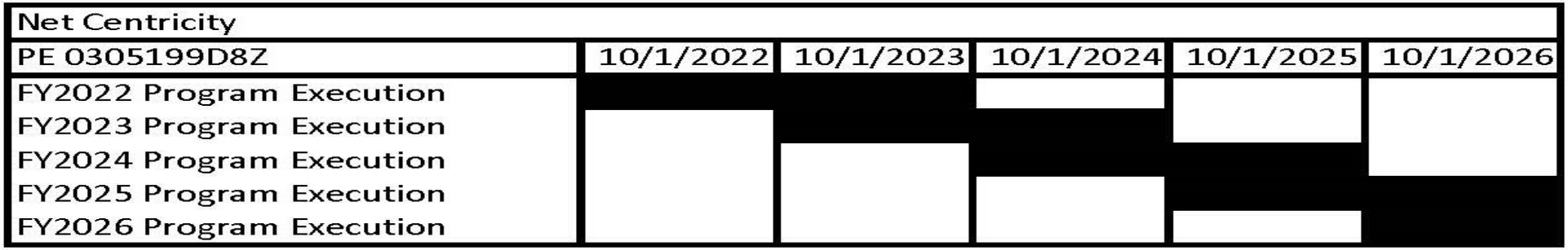


Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 7	**R-1 Program Element (Number/Name)** PE 0305199D8Z / *Net Centricity*	**Project (Number/Name)** 199 / *GIG Evaluation Facilities (GIG-EF) and GIG Enterprise-Wide Systems 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	3	2022	2	2023
FY 2023 Projected Execution	3	2023	2	2024
FY 2024 Projected Execution	3	2024	2	2025
FY 2025 Projected Execution	3	2025	2	2026
FY 2026 Projected Execution	3	2026	4	2026

THIS PAGE INTENTIONALLY LEFT BLANK

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 0305387D8Z / *Homeland Defense Technology Transfer Program*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	21.556	2.203	2.188	1.273	-	1.273	-	-	-	-	-	-
387: *Homeland Defense Technology Transfer Program*	21.556	2.203	2.188	1.273	-	1.273	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The 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. The program meets the Congressional intent of Sec 1401, FY 2003 National Defense Authorization Act (P.L. 107-314) and supports the National Defense Strategy through continuously delivering performance with affordability and speed as we change Departmental mindset, culture, and management systems.

The program consolidates and coordinates 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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	2.221	2.190	2.304	-	2.304
Current President's Budget	2.203	2.188	1.273	-	1.273
Total Adjustments	-0.018	-0.002	-1.031	-	-1.031
• Congressional General Reductions	-	-0.002			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Program Adjustment	-0.018	-	-1.031	-	-1.031

Change Summary Explanation

The FY 2022 funding request was reduced by $0.970 million to account for the availability of prior year execution balances.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 0305387D8Z / *Homeland Defense Technology Transfer Program*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Homeland Defense Technology Transfer Program	2.203	2.188	1.273
Description: Provide outreach through coordination and cooperation with inter-agency partners to provide dual-use technology and equipment to first responders. Ensure DoD components conduct Technology Transfer programs that are appropriate for the respective component. Provide information to stakeholders on equipment and technology use and availability. ***FY 2021 Plans:*** - Continue research on ongoing programs such as Project Emily training and testing. Support COVID research to include the use of COVID sniffing dogs. - Use a consortium of subject matter experts/governance councils to prioritize technology transfer requirements and expedite DoD dual-use technologies. - Continue program outreach activities and prioritize outreach to reflect efficiencies. - Enhance and expedite excess equipment transfer capabilities from service level divestiture efforts and overseas contingency operations. ***FY 2022 Plans:*** - Continue efforts in support of the first responder community.. - Use a consortium of subject matter experts/governance councils to prioritize technology transfer requirements and expedite DoD dual-use technologies. - Continue program outreach activities and prioritize outreach to reflect efficiencies. - Enhance and expedite excess equipment transfer capabilities from service level divestiture efforts and overseas contingency operations. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The FY 2022 funding request was reduced by $0.970 million to account for the availability of prior year execution balances.			
Accomplishments/Planned Programs Subtotals	2.203	2.188	1.273

D. Other Program Funding Summary ($ in Millions)

N/A

Remarks

E. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 7	R-1 Program Element (Number/Name) PE 0305387D8Z / *Homeland Defense Technology Transfer Program*	Project (Number/Name) 387 / *Homeland Defense Technology Transfer Program*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 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	21.556	2.203		2.188		1.273		-		1.273	Continuing	Continuing	-
		Subtotal	21.556	2.203		2.188		1.273		-		1.273	Continuing	Continuing	N/A

Remarks

N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	21.556	2.203		2.188		1.273		-		1.273	Continuing	Continuing	N/A

Remarks

N/A

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 7	**R-1 Program Element (Number/Name)** PE 0305387D8Z / *Homeland Defense Technology Transfer Program*	**Project (Number/Name)** 387 / *Homeland Defense Technology Transfer Program*

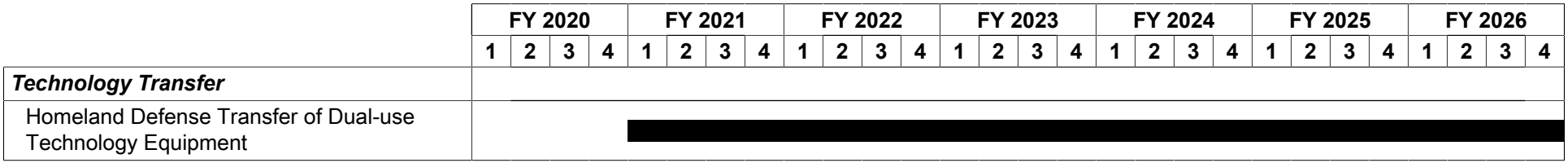


Exhibit R-4A, RDT&E Schedule Details: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 7	**R-1 Program Element (Number/Name)** PE 0305387D8Z / *Homeland Defense Technology Transfer Program*	**Project (Number/Name)** 387 / *Homeland Defense Technology Transfer Program*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Technology Transfer				
Homeland Defense Transfer of Dual-use Technology Equipment	1	2021	4	2026

THIS PAGE INTENTIONALLY LEFT BLANK

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 8: *Software and Digital Technology Pilot Programs*	**R-1 Program Element (Number/Name)** PE 0608648D8Z / *Acquisition Visibility - Software Pilot Program*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	0.000	0.000	16.838	18.307	-	18.307	-	-	-	-	Continuing	Continuing
059: *Acquisition Visibility*	0.000	0.000	16.838	18.307	-	18.307	-	-	-	-	Continuing	Continuing

Note

This program is not a new start. Acquisition Visibility (AV) is a Software Pilot Program under the new BA 8 authority approved for FY 2021 and beyond. FY 2020 and 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 program to deliver 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 Framework (AVDF), and accelerate the retirement of costly legacy systems. AV is an authoritative source for acquisition data inside the DoD and for Congress, GAO, and the Inspectors General for multiple Adaptive Acquisition Framework (AAF) Acquisition Pathways including all Acquisition Category (ACAT) I – IV programs, Middle Tier of Acquisition programs, and National Command, Control, and Communications covered programs. Planned efforts include support to the acquisition data strategy requirements of FY 2021 NDAA Section 836 and data collection and sharing for additional AAF Pathways, to include Defense Business Systems and Software Acquisition. Multiple acquisition data collection and analysis platforms rely on AV systems for authoritative acquisition data, including but not limited to: OSD Comptroller Advanced Analytics (ADVANA), Air Force and Army Program Metrics and Reporting Tool, Navy Research, Development and Acquisition Information System, and the Earned Value Management Central Repository.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	16.848	17.150	-	17.150
Current President's Budget	0.000	16.838	18.307	-	18.307
Total Adjustments	0.000	-0.010	1.157	-	1.157
• Congressional General Reductions	-	-0.010			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Program Adjustments	-	-	1.157	-	1.157

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 8: *Software and Digital Technology Pilot Programs*	**R-1 Program Element (Number/Name)** PE 0608648D8Z *I Acquisition Visibility - Software Pilot Program*

Change Summary Explanation

The upward program adjustment in FY 2022 supports: 1) costs associated with the accelerated development and deployment of DAVE to facilitate the retirement of legacy capabilities; 2) the expanded development of AV Capabilities to support the acquisition data requirements of multiple Acquisition Pathways of the Adaptive Acquisition Framework; and 3) the acquisition data requirements of FY 2021 NDAA Section 836.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 8	R-1 Program Element (Number/Name) PE 0608648D8Z / *Acquisition Visibility - Software Pilot Program*	Project (Number/Name) 059 / *Acquisition Visibility*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
059: *Acquisition Visibility*	0.000	0.000	16.838	18.307	-	18.307	-	-	-	-	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Acquisition Visibility delivers authoritative, reliable acquisition data to Congress and the Department to enable statutory reporting, executive decision making, and portfolio insight on almost $2 trillion in lifecycle funding across ~100 ACAT I, ~2,500 Acquisition Category (ACAT) II, III, and IV programs, National Command, Control, and Communications covered programs, and approximately 75 Middle Tier of Acquisition (MTA) programs. The $1.157 million total program increase in FY 2022 supports: 1) costs associated with the accelerated development and deployment of DAVE to facilitate the retirement of legacy capabilities; 2) the expanded development of AV Capabilities to support the acquisition data requirements of multiple Acquisition Pathways of the Adaptive Acquisition Framework; and 3) support the acquisition data requirements of FY 2021 NDAA Section 836.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Acquisition Visibility Operation & Maintenance Efforts	-	6.262	5.162
Description: As a BA-08 program, Acquisition Visibility O&M-related investments enhance insight into to the Department's acquisition programs and portfolios for the Defense Acquisition Executive (DAE), Component Acquisition Executives (CAEs), Service Chiefs of Staff, Office of the Secretary of Defense (OSD) senior leaders, and OSD and Component analysts by providing acquisition data science and analytics, maintaining the Acquisition Visibility Data Framework (AVDF) and expanding the AVDF to include multiple Adaptive Acquisition Framework Pathways, and maintaining the Acquisition Information Repository (AIR) and Defense Acquisition Management Information and Retrieval (DAMIR) legacy systems. ***FY 2021 Plans:*** • Provide acquisition data analyses and visualizations. • Maintain and enhance AVDF to include multiple AAF Pathways. • Maintain AIR. • Prepare DAMIR to transition to DAVE. ***FY 2022 Plans:*** • Complete the transition from the legacy DAMIR to DAVE. • Archive Major Capability Program data from DAMIR. • Provide acquisition data analyses and visualizations. • Maintain and enhance AIR. • Expand the Acquisition Data Framework to include data for additional AAF pathways.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 8	**R-1 Program Element (Number/Name)** PE 0608648D8Z / *Acquisition Visibility - Software Pilot Program*	**Project (Number/Name)** 059 / *Acquisition Visibility*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
• Support FY 2021 NDAA Section 836 data strategy development and analysis. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The downward adjustment for FY 2022 represents savings obtained by the retirement of the legacy DAMIR system. O&M costs are decreasing as DAMIR begins transition of its functionality to DAVE.			
Title: Acquisition Visibility RDT&E Efforts ***Description:*** As a BA-08 program, Acquisition Visibility's RDT&E-related investments develop and enhance software Capabilities to enhance program and portfolio insight of the Department's acquisition programs for the Defense Acquisition Executive (DAE), Component Acquisition Executives (CAEs), Service Chiefs of Staff, Office of the Secretary of Defense (OSD) senior leaders, and OSD and Component analysts. The Defense Acquisition Visibility Environment (DAVE) is an authoritative source for acquisition data inside the DoD and for the Congress, GAO, and the Inspectors General for multiple Adaptive Acquisition Framework (AAF) Acquisition Pathways including all Acquisition Category (ACAT) I – IV programs, Middle Tier of Acquisition programs, and National Command, Control, and Communications covered programs. ***FY 2021 Plans:*** • Continue development and testing to enable the Minimally Viable DAVE to assume the legacy DAMIR system's critical functions. • Sustain and enhance DAVE capabilities. ***FY 2022 Plans:*** • Enhance DAVE data sharing with OSD Comptroller Advanced Analytics (ADVANA), Air Force and Army Program Metrics and Reporting Tool, Navy Research, Development and Acquisition Information System, and the OSD Earned Value Management Central Repository. • Complete the transition from the legacy DAMIR system to DAVE. • Develop, test, and deploy new features and capabilities for additional AAF Pathways and the data needs of FY 2021 NDAA Section 836. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The upward adjustment for FY 2022 supports: 1) costs associated with the accelerated development and deployment of DAVE to facilitate the retirement of legacy capabilities; 2) the expanded development of AV Capabilities to support the acquisition data requirements of multiple Acquisition Pathways of the Adaptive Acquisition Framework; 3) the acquisition data requirements of FY 2021 NDAA Section 836, and 4) fact of life costs related to contract cost escalation. Net total program upward adjustment after re-investing DAMIR transition savings is $1.157 million.	0.000	10.576	13.145
Accomplishments/Planned Programs Subtotals	0.000	16.838	18.307

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 8	**R-1 Program Element (Number/Name)** PE 0608648D8Z / *Acquisition Visibility - Software Pilot Program*	**Project (Number/Name)** 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.

THIS PAGE INTENTIONALLY LEFT BLANK

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 8: *Software and Digital Technology Pilot Programs*	**R-1 Program Element (Number/Name)** PE 0308588D8Z *I Algorithmic Warfare Cross Functional Teams - Software Pilot Program*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	0.000	0.000	229.943	247.452	-	247.452	-	-	-	-	-	-
925: *Algorithmic Warfare Cross Functional Teams - Software Pilot Program*	0.000	0.000	229.943	247.452	-	247.452	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

The Algorithmic Warfare Cross Functional Team (Project Maven) is the pathfinder artificial intelligence (AI) initiative for the DoD that accelerates the integration of AI into DoD systems to improve warfighting speed and lethality for a rapidly innovating Joint Force. Maven deploys capabilities that complement human cognition by automating key tasks of object identification and tracking, and by deriving insights from large-scale data sets to create immediately actionable intelligence. Maven's AI architecture initially automated and augmented Processing, Exploitation and Dissemination (PED) of Full Motion Video (FMV) from Tactical Unmanned Aerial Vehicles (TUAVs). Maven additionally developed algorithms to Medium Altitude, High Altitude, and Wide Area Motion Imagery (WAMI) Intelligence and multiple other Surveillance, and Reconnaissance (ISR) platforms to support the National Defense Strategy (NDS). Maven includes AI tools used on Captured Enemy Material (CEM), Maritime, Overhead Persistent Infrared Programs (OPIR), and Public Available Information (PAI) exploitation. Most military intelligence exploitation systems were designed pre-AI and require specialized integration and multiple individuals to control and then enable the insertion of algorithms into their software baseline. Maven developed a path forward to eliminate substantial costs and coordination among myriad legacy projects to instead use a single screen with multiple AI-enabled layers and tools. Altogether, Maven increases the value of ISR, reduces human processing so analysts can multi-task and produce more intel, and it now detects, classifies, and tracks objects exponentially faster than a human. With FMV intel, for example, Maven detects/tracks persons, vehicles, and weapon systems. By combining AI detections, tracks, and insights onto a single screen, Maven created tools for deployment to help mission commanders, operations personnel, and intel analysts to unite their increased productivity in conducting military operations in every domain of warfare – air, land, sea, space, and cyberspace.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	250.107	252.176	-	252.176
Current President's Budget	0.000	229.943	247.452	-	247.452
Total Adjustments	0.000	-20.164	-4.724	-	-4.724
• Congressional General Reductions	-	-20.164			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Program Adjustment	-	-	-4.724	-	-4.724

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Office of the Secretary Of Defense	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 8: *Software and Digital Technology Pilot Programs*	**R-1 Program Element (Number/Name)** PE 0308588D8Z *I Algorithmic Warfare Cross Functional Teams - Software Pilot Program*

Change Summary Explanation

FY 2022 decrease due to minor program adjustments.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense			Date: May 2021
Appropriation/Budget Activity 0400 / 8	R-1 Program Element (Number/Name) PE 0308588D8Z / *Algorithmic Warfare Cross Functional Teams - Software Pilot Program*	Project (Number/Name) 925 / *Algorithmic Warfare Cross Functional Teams - Software Pilot Program*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
925: *Algorithmic Warfare Cross Functional Teams - Software Pilot Program*	0.000	0.000	229.943	247.452	-	247.452	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Project Maven funds and fields increasing amounts of automation to FMV ground exploitation stations for TUAVs, to Medium Altitude, High Altitude ISR platforms, and for the exploitation of commercial and military satellite imagery. Project Maven accelerates the development and deployment of AI capabilities across the Defense Intelligence Enterprise, including exploitation of CEM, Maritime, OPIR and PAI. In these areas, Maven uses AI, deep learning, and algorithms to detect, classify, and track objects not only within FMV images (e.g., persons, vehicles, and weapons) but also to provide insights in combinations of these and other areas of imagery, data, and text- and sensor-based projects. Maven algorithms increase the intelligence value of ISR, reduce the human burden of screening and analyzing, and seed the generation of insight from GEOINT and other intelligence areas. To produce these results, Project Maven funds commercial technologies that insert commercial AI into existing platforms and programs of record, providing capability that augments and will eventually automate key parts of intelligence workflows. 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 intelligence mission areas in support of the NDS. As Maven algorithms increase in capability, the algorithms have moved to the edge (on sensor platforms). Further information is available at a higher classification level.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Algorithmic Warfare Cross Functional Teams - Software Pilot Program	0.000	229.943	247.452
Description: Project Maven rapidly fields AI to programs and systems that augment and automate PED for FMV of TUAVs, Medium Altitude, High Altitude, WAMI ISR, commercial and military satellite imagery in support of the NDS peer/near peer competitor strategy. Aside from imagery, Maven also uses AI to exploit CEM, Maritime, OPIR and PAI. Maven's AI, deep learning, and computer vision algorithms and insights are developed for use in theater to detect, classify, and track objects within images (e.g., persons, vehicles, and weapons) as well as provide other insights, such as with CEM, text-based, and other projects. Maven algorithms are still in development in all its lines of effort. While Maven's algorithms advance to increase the intelligence value of ISR and reduce the human burden on analysts, Maven develops complementary software that both analysts and operations personnel use to rapidly react, effectively plan, and clearly communicate. Project Maven's development process requires continuous feedback and substantial changes to mature user interfaces, build AI harnesses to run algorithms, and build labeled data sets. As the underlying Maven systems continue to develop new tools for mission operations, Project Maven must constantly manage a shifting R&D budget in critical AI architecture that supports the rapid expansion of AI. In the future, these developments are expected to resolve into licensing or other COTS-based solutions. For now, agility is required			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 8	**R-1 Program Element (Number/Name)** PE 0308588D8Z / *Algorithmic Warfare Cross Functional Teams - Software Pilot Program*	**Project (Number/Name)** 925 / *Algorithmic Warfare Cross Functional Teams - Software Pilot Program*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
to turn R&D mission successes into production for procurement and sustainment by Services, SOCOM and CCMDs. While Maven's applications are developing, near-term and future requirements become more identifiable. However, certain nascent lines of effort will continue to require modification and advancement. Maven plans for the process to create a more robust and refined set of requirements, albeit with substantial room to continue to invest in better AI training data and better algorithms for years to come. Separately, budgeting flexibility is important to Maven because Maven applies R&D to integrate news tools with legacy systems. Most military intelligence exploitation systems were designed pre-AI and therefore require specialized integration to enable the insertion of algorithms into the software baseline. Maven funds multiple approaches for bridging these technology hurdles which provides for multiple pathways. Critical is testing and evaluation and user feedback. Maven's successes, however, have already been deemed mission critical and have transitioned to procurement efforts. At this time, lines of effort continue to mature. Appropriation flexibility is critical to transitioning the current RDT&E funding of complex systems into licenses and requirements, purchasable by Services and COCOMs. To continue to deliver outstanding capability, Project Maven will enforce rigorous competition among commercial technology vendors who compete for the opportunity to be inserted into existing R&D projects that transition into O&M / Procurement efforts. Maven expects to continue to transition lines of effort to Title 10 Procurement paths through FY23-FY25. For now, as Maven algorithms increase in performance and complexity, the systems receiving funding will both continue to require R&D funds, for example as they move to the edge on sensor platforms, but will also become funded with a budget used for operating and maintaining the complex but better-defined software systems. Additional details on accomplishments, capabilities, and R&D strategies are available at a higher classification level. ***FY 2021 Plans:*** Project Maven uses rapid prototype sprints to field increasing amounts of augmentation and automation to FMV ground exploitation stations for TUAVs, Medium Altitude, High Altitude, WAMI ISR platforms, and commercial and military satellites. These sprints incentivize competition between vendors but also require collaboration between sprints to accelerate development and deployment of AI capabilities across the Defense Intelligence Enterprise and rapid deployment of innovations to the Joint Force. Other lines of effort for exploitation include CEM, OPIR and PAI. Project Maven continues 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 to bring AI deeper into the process of object detection, identification, and tracking at computer process speeds versus human speeds. Incorporating computer vision, algorithms, and other tools will reduce the human burden and provide efficient and effective exploration of data to create multi-modal and correlated insights. Among other plans, Project Maven continues to develop algorithms focused on tactical UAV Automatic Target Recognition (ATR) and an operational PED environment for platforms and ground stations. Project Maven will continue to build capabilities that integrate AI and ML to create			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 8	**R-1 Program Element (Number/Name)** PE 0308588D8Z / *Algorithmic Warfare Cross Functional Teams - Software Pilot Program*	**Project (Number/Name)** 925 / *Algorithmic Warfare Cross Functional Teams - Software Pilot Program*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
actionable intelligence, advanced decision-making, and user alerts. Additional details on lines of effort are available at a higher classification level. ***FY 2022 Plans:*** Project Maven will begin the pre-transfer of activities supporting the transition of GEOINT functions associated with Maven's AI Training Foundry (AITF) to the National Geospatial Intelligence Agency in FY22. NGA shall provide the AITF core AI Enterprise Responsibilities to the Services and SOCOM for GEOINT. Project Maven will continue to transition lines of effort to a program of record, Service, or Agency. Project Maven will cede funding authorities to the transition partner and will concomitantly transfer production procurement obligations to the services and combatant commands. Project Maven will continue to rapidly conduct prototype sprints that field augmentation tools, such as for Medium Altitude, High Altitude, WAMI ISR and commercial and military satellite SAR and EO. While these sprints incentivize competition among vendors, Maven also requires collaboration among vendors between separate sprints to accelerate successful vendors' development and deployment of AI capabilities across the Defense Intelligence Enterprise for the Joint Force. Non-GEOINT lines of effort include CEM, Maritime, OPIR and PAI. Project Maven will continue to use artificial intelligence, deep learning, and computer vision algorithms to detect, classify, and track objects, and will use other AI algorithms to bring AI deeper into the process of object detection, identification, and tracking at computer processing speeds versus human speeds. Incorporating these and other tools will reduce the human burden and provide efficient and effective exploration of data to create multi-modal and correlated insights. Among other plans, Project Maven will continue to develop algorithms focused on combining tactical UAV Automatic Target Recognition and an operational PED environment for platforms and ground stations. Project Maven will continue to build capabilities that integrate AI and ML to create actionable intelligence, advanced decision-making, and user alerts. Additional details on lines of effort are available at a higher classification level. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** No significant increase.			
Accomplishments/Planned Programs Subtotals	0.000	229.943	247.452

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2022 Office of the Secretary Of Defense		Date: May 2021
Appropriation/Budget Activity 0400 / 8	**R-1 Program Element (Number/Name)** PE 0308588D8Z / *Algorithmic Warfare Cross Functional Teams - Software Pilot Program*	**Project (Number/Name)** 925 / *Algorithmic Warfare Cross Functional Teams - Software Pilot Program*

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 available to cross-functional teams. Management uses project management tools, executive steering group and working group meetings to ensure that stated capabilities and performance criteria are delivered.