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**Department of Defense
Fiscal Year (FY) 2020 Budget Estimates**

March 2019



Office of the Secretary Of Defense

Defense-Wide Justification Book Volume 3 of 5

Research, Development, Test & Evaluation, Defense-Wide

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Research, Development, Test and Evaluation, Defense-Wide

The Fiscal Year (FY) 2020 Overseas Contingency Operations funding can be separated into the following categories:

- OCO for Enduring Requirements (\$401,950,000): OCO for Enduring Requirements are enduring in-theater and in-CONUS costs that will likely remain after combat operations cease, and have previously been funded in OCO.
- OCO for Base Requirements (\$426,000,000): OCO for Base Requirements is OCO funding for base budget requirements in support of the National Defense Strategy. The Budget requests these funds in OCO to comply with the base budget defense caps included in the Budget Control Act of 2011.

Preparation of the Defense-Wide budget, excluding revolving funds, cost the Department of Defense a total of approximately \$1,196,500 in FY 2019.

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Office of the Secretary Of Defense • Budget Estimates FY 2020 • RDT&E Program

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National Geospatial-Intelligence Agency.....(see NIP and MIP Justification Books)

Defense Intelligence Agency..... (see NIP and MIP Justification Books)

National Security Agency.....(see NIP and MIP Justification Books)

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**Research, Development, Test and Evaluation, Defense-Wide
Office of the Secretary of Defense
OCO**

Budget Activity: 03

Line number: 25

Program Element: 0603122D8Z

Program Element Title: Combating Terrorism Technology Support

OCO for Base Requirements (\$25,230): OCO for Base Requirements is OCO funding for base budget requirements in support of the National Defense Strategy. The Budget requests these funds in OCO to comply with the base budget defense caps included in the Budget Control Act of 2011.

Funds will used to support: Subterranean Activities (Tunneling), CBRNE Activities, Improvised Device Defeat Systems, Irregular Warfare and Evolving Threats, Personnel Protection Equipment, Physical Security, Surveillance, Collection and Operations Support, Tactical Operations Support, and Training Technology Development.

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Department of Defense
 FY 2020 President's Budget
 Exhibit R-1 FY 2020 President's Budget
 Total Obligational Authority
 (Dollars in Thousands)

12 Mar 2019

Appropriation	FY 2018 (Base + OCO)	FY 2019 Base Enacted	FY 2019 OCO Enacted	FY 2019 Total Enacted
Research, Development, Test & Eval, DW	5,364,060	5,829,463		5,829,463
Total Research, Development, Test & Evaluation	5,364,060	5,829,463		5,829,463

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Appropriation	FY 2020 Base	FY 2020 OCO for Base Requirements	FY 2020 OCO for Direct War and Enduring Costs	FY 2020 Total OCO	FY 2020 Total (Base + OCO)
Research, Development, Test & Eval, DW	5,264,901		25,230	25,230	5,290,131
Total Research, Development, Test & Evaluation	5,264,901		25,230	25,230	5,290,131

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Summary Recap of Budget Activities	FY 2018 (Base + OCO)	FY 2019 Base Enacted	FY 2019 OCO Enacted	FY 2019 Total Enacted

Basic Research	178,907	232,503		232,503
Applied Research	137,537	155,369		155,369
Advanced Technology Development	1,331,773	1,322,894		1,322,894
Advanced Component Development And Prototypes	2,215,242	2,522,867		2,522,867
System Development And Demonstration	506,829	643,501		643,501
Management Support	911,883	848,805		848,805
Operational System Development	81,889	103,524		103,524
Total Research, Development, Test & Evaluation	5,364,060	5,829,463		5,829,463
Summary Recap of FYDP Programs				

General Purpose Forces	5,479	9,985		9,985
Intelligence and Communications	209,666	289,748		289,748
Research and Development	5,148,915	5,529,730		5,529,730
Total Research, Development, Test & Evaluation	5,364,060	5,829,463		5,829,463

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Basic Research	171,656				171,656
Applied Research	158,521				158,521
Advanced Technology Development	1,317,055		25,230	25,230	1,342,285
Advanced Component Development And Prototypes	2,309,110				2,309,110
System Development And Demonstration	395,142				395,142
Management Support	793,095				793,095
Operational System Development	120,322				120,322
Total Research, Development, Test & Evaluation	5,264,901		25,230	25,230	5,290,131
Summary Recap of FYDP Programs					

General Purpose Forces	3,037				3,037
Intelligence and Communications	390,192				390,192
Research and Development	4,871,672		25,230	25,230	4,896,902
Total Research, Development, Test & Evaluation	5,264,901		25,230	25,230	5,290,131

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

Line No	Program Element Number	Item	Act	FY 2018 (Base + OCO)	FY 2019 Base Enacted	FY 2019 OCO Enacted	FY 2019 Total Enacted	Se c
3	0601110D8Z	Basic Research Initiatives	01	39,051	56,573		56,573	U
5	0601120D8Z	National Defense Education Program	01	100,850	135,610		135,610	U
6	0601228D8Z	Historically Black Colleges and Universities/Minority Institutions	01	39,006	40,320		40,320	U
		Basic Research		178,907	232,503		232,503	
8	0602000D8Z	Joint Munitions Technology	02	19,053	19,126		19,126	U
11	0602234D8Z	Lincoln Laboratory Research Program	02	47,891	51,479		51,479	U
12	0602251D8Z	Applied Research for the Advancement of S&T Priorities	02	47,550	60,550		60,550	U
16	0602668D8Z	Cyber Security Research	02	14,429	14,935		14,935	U
21	0602751D8Z	Software Engineering Institute (SEI) Applied Research	02	8,614	9,279		9,279	U
		Applied Research		137,537	155,369		155,369	
23	0603000D8Z	Joint Munitions Advanced Technology	03	25,550	25,540		25,540	U
24	0603121D8Z	SO/LIC Advanced Development	03					U
25	0603122D8Z	Combating Terrorism Technology Support	03	149,541	171,321		171,321	U
26	0603133D8Z	Foreign Comparative Testing	03	21,715	24,277		24,277	U
32	0603225D8Z	Joint DoD-DoE Munitions Technology Development	03	17,959	18,602		18,602	U
35	0603288D8Z	Analytic Assessments	03	12,658	18,430		18,430	U
36	0603289D8Z	Advanced Innovative Analysis and Concepts	03	36,763	37,178		37,178	U

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

Line No	Program Element Number	Item	Act	FY 2020 Base	FY 2020 OCO for Base Requirements	FY 2020 OCO for Direct War and Enduring Costs	FY 2020 Total OCO	FY 2020 Total (Base + OCO)	Se
3	0601110D8Z	Basic Research Initiatives	01	48,874				48,874	U
5	0601120D8Z	National Defense Education Program	01	92,074				92,074	U
6	0601228D8Z	Historically Black Colleges and Universities/Minority Institutions	01	30,708				30,708	U
		Basic Research		171,656				171,656	
8	0602000D8Z	Joint Munitions Technology	02	19,306				19,306	U
11	0602234D8Z	Lincoln Laboratory Research Program	02	52,317				52,317	U
12	0602251D8Z	Applied Research for the Advancement of S&T Priorities	02	62,200				62,200	U
16	0602668D8Z	Cyber Security Research	02	15,118				15,118	U
21	0602751D8Z	Software Engineering Institute (SEI) Applied Research	02	9,580				9,580	U
		Applied Research		158,521				158,521	
23	0603000D8Z	Joint Munitions Advanced Technology	03	25,779				25,779	U
24	0603121D8Z	SO/LIC Advanced Development	03	5,000				5,000	U
25	0603122D8Z	Combating Terrorism Technology Support	03	70,517		25,230	25,230	95,747	U
26	0603133D8Z	Foreign Comparative Testing	03	24,970				24,970	U
32	0603225D8Z	Joint DoD-DoE Munitions Technology Development	03	18,773				18,773	U
35	0603288D8Z	Analytic Assessments	03	19,429				19,429	U
36	0603289D8Z	Advanced Innovative Analysis and Concepts	03	37,645				37,645	U

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

Line	Program Element No Number	Item	Act	FY 2018 (Base + OCO)	FY 2019 Base Enacted	FY 2019 OCO Enacted	FY 2019 Total Enacted	S e c
37	0603291D8Z	Advanced Innovative Analysis and Concepts - MHA	03	14,971	13,590		13,590	U
40	0603342D8Z	Defense Innovation Unit (DIU)	03					U
41	0603375D8Z	Technology Innovation	03	24,825	33,068		33,068	U
43	0603527D8Z	RETRACT LARCH	03	164,544	160,762		160,762	U
44	0603618D8Z	Joint Electronic Advanced Technology	03	14,020	12,889		12,889	U
45	0603648D8Z	Joint Capability Technology Demonstrations	03	102,769	105,808		105,808	U
46	0603662D8Z	Networked Communications Capabilities	03	12,369	12,667		12,667	U
47	0603680D8Z	Defense-Wide Manufacturing Science and Technology Program	03	206,257	174,489		174,489	U
49	0603699D8Z	Emerging Capabilities Technology Development	03	79,469	60,700		60,700	U
51	0603716D8Z	Strategic Environmental Research Program	03	63,055	76,340		76,340	U
53	0603727D8Z	Joint Warfighting Program	03	3,236	5,978		5,978	U
58	0603769D8Z	Distributed Learning Advanced Technology Development	03	11,053	13,564		13,564	U
59	0603781D8Z	Software Engineering Institute	03	14,468	15,016		15,016	U
60	0603826D8Z	Quick Reaction Special Projects	03	64,775	59,490		59,490	U
61	0603833D8Z	Engineering Science & Technology	03	24,447	19,371		19,371	U
62	0603924D8Z	High Energy Laser Advanced Technology Program	03		74,364		74,364	U

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Line No	Program Element Number	Item	Act	FY 2020 Base	FY 2020 OCO for Base Requirements	FY 2020 OCO for Direct War and Enduring Costs	FY 2020 Total OCO	FY 2020 Total (Base + OCO)	Se c
37	0603291D8Z	Advanced Innovative Analysis and Concepts - MHA	03	14,668				14,668	U
40	0603342D8Z	Defense Innovation Unit (DIU)	03	29,398				29,398	U
41	0603375D8Z	Technology Innovation	03	60,000				60,000	U
43	0603527D8Z	RETRACT LARCH	03	159,688				159,688	U
44	0603618D8Z	Joint Electronic Advanced Technology	03	12,063				12,063	U
45	0603648D8Z	Joint Capability Technology Demonstrations	03	107,359				107,359	U
46	0603662D8Z	Networked Communications Capabilities	03	2,858				2,858	U
47	0603680D8Z	Defense-Wide Manufacturing Science and Technology Program	03	96,397				96,397	U
49	0603699D8Z	Emerging Capabilities Technology Development	03	80,911				80,911	U
51	0603716D8Z	Strategic Environmental Research Program	03	66,157				66,157	U
53	0603727D8Z	Joint Warfighting Program	03	4,846				4,846	U
58	0603769D8Z	Distributed Learning Advanced Technology Development	03	13,723				13,723	U
59	0603781D8Z	Software Engineering Institute	03	15,111				15,111	U
60	0603826D8Z	Quick Reaction Special Projects	03	47,147				47,147	U
61	0603833D8Z	Engineering Science & Technology	03	19,376				19,376	U
62	0603924D8Z	High Energy Laser Advanced Technology Program	03	85,223				85,223	U

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

Line No	Program Element Number	Item	Act	FY 2018 (Base + OCO)	FY 2019 Base Enacted	FY 2019 OCO Enacted	FY 2019 Total Enacted	S e c
63	0603941D8Z	Test & Evaluation Science & Technology	03	108,958	117,389		117,389	U
64	0603950D8Z	National Security Innovation Network	03					U
65	0604055D8Z	Operational Energy Capability Improvement	03	39,788	45,478		45,478	U
66	0303310D8Z	CWMD Systems	03	32,111	26,583		26,583	U
67	0303367D8Z	Spectrum Access Research and Development	03	86,472				U
		Advanced Technology Development		1,331,773	1,322,894		1,322,894	
70	0603161D8Z	Nuclear and Conventional Physical Security Equipment RDT&E ADC&P	04	32,165	28,076		28,076	U
71	0603600D8Z	WALKOFF	04	98,920	92,012		92,012	U
72	0603821D8Z	Acquisition Enterprise Data & Information Services	04	2,194	2,500		2,500	U
73	0603851D8Z	Environmental Security Technical Certification Program	04	53,342	41,925		41,925	U
89	0603920D8Z	Humanitarian Demining	04	10,519	11,262		11,262	U
90	0603923D8Z	Coalition Warfare	04	10,515	8,509		8,509	U
91	0604016D8Z	Department of Defense Corrosion Program	04	4,503	8,458		8,458	U
93	0604132D8Z	Missile Defeat Project	04	121,025	43,508		43,508	U
96	0604250D8Z	Advanced Innovative Technologies	04	1,423,173	1,387,539		1,387,539	U
97	0604294D8Z	Trusted & Assured Microelectronics	04	147,481	522,950		522,950	U
98	0604331D8Z	Rapid Prototyping Program	04	46,984	99,107		99,107	U

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63	0603941D8Z	Test & Evaluation Science & Technology	03	175,574				175,574	U
64	0603950D8Z	National Security Innovation Network	03	25,000				25,000	U
65	0604055D8Z	Operational Energy Capability Improvement	03	70,536				70,536	U
66	0303310D8Z	CWMD Systems	03	28,907				28,907	U
67	0303367D8Z	Spectrum Access Research and Development	03						U
		Advanced Technology Development		1,317,055		25,230	25,230	1,342,285	
70	0603161D8Z	Nuclear and Conventional Physical Security Equipment RDT&E ADC&P	04	42,695				42,695	U
71	0603600D8Z	WALKOFF	04	92,791				92,791	U
72	0603821D8Z	Acquisition Enterprise Data & Information Services	04	5,659				5,659	U
73	0603851D8Z	Environmental Security Technical Certification Program	04	66,572				66,572	U
89	0603920D8Z	Humanitarian Demining	04	10,820				10,820	U
90	0603923D8Z	Coalition Warfare	04	11,316				11,316	U
91	0604016D8Z	Department of Defense Corrosion Program	04	3,365				3,365	U
93	0604132D8Z	Missile Defeat Project	04	17,816				17,816	U
96	0604250D8Z	Advanced Innovative Technologies	04	1,312,735				1,312,735	U
97	0604294D8Z	Trusted & Assured Microelectronics	04	542,421				542,421	U
98	0604331D8Z	Rapid Prototyping Program	04	100,957				100,957	U

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99	0604341D8Z	Defense Innovation Unit (DIU) Prototyping	04					U
100	0604400D8Z	Department of Defense (DoD) Unmanned System Common Development	04	7,839	7,763		7,763	U
101	0604532D8Z	Joint Artificial Intelligence	04		12,970		12,970	U
104	0604682D8Z	Wargaming and Support for Strategic Analysis (SSA)	04	3,686	3,759		3,759	U
106	0604775D8Z	Defense Rapid Innovation Program	04	250,000	249,432		249,432	U
118	0303191D8Z	Joint Electromagnetic Technology (JET) Program	04	2,896	3,097		3,097	U
		Advanced Component Development And Prototypes		2,215,242	2,522,867		2,522,867	
123	0604161D8Z	Nuclear and Conventional Physical Security Equipment RDT&E SDD	05	12,320	8,314		8,314	U
124	0604165D8Z	Prompt Global Strike Capability Development	05	360,860	465,852		465,852	U
126	0604771D8Z	Joint Tactical Information Distribution System (JTIDS)	05	24,268	34,425		34,425	U
130	0605022D8Z	Defense Exportability Program	05	2,088	1,486		1,486	U
131	0605027D8Z	OUSD(C) IT Development Initiatives	05	21,312	9,568		9,568	U
133	0605075D8Z	CMO Policy and Integration	05	2,805	2,100		2,100	U
136	0605210D8Z	Defense-Wide Electronic Procurement Capabilities	05	11,414	6,359		6,359	U
137	0605294D8Z	Trusted & Assured Microelectronics	05	59,516	95,959		95,959	U
140	0305304D8Z	DoD Enterprise Energy Information Management (EEIM)	05	4,032	2,429		2,429	U

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99 0604341D8Z	Defense Innovation Unit (DIU) Prototyping	04	92,000				92,000	U
100 0604400D8Z	Department of Defense (DoD) Unmanned System Common Development	04	3,021				3,021	U
101 0604532D8Z	Joint Artificial Intelligence	04						U
104 0604682D8Z	Wargaming and Support for Strategic Analysis (SSA)	04	3,751				3,751	U
106 0604775D8Z	Defense Rapid Innovation Program	04						U
118 0303191D8Z	Joint Electromagnetic Technology (JET) Program	04	3,191				3,191	U
	Advanced Component Development And Prototypes		2,309,110				2,309,110	
123 0604161D8Z	Nuclear and Conventional Physical Security Equipment RDT&E SDD	05	11,276				11,276	U
124 0604165D8Z	Prompt Global Strike Capability Development	05	107,000				107,000	U
126 0604771D8Z	Joint Tactical Information Distribution System (JTIDS)	05	40,102				40,102	U
130 0605022D8Z	Defense Exportability Program	05	17,615				17,615	U
131 0605027D8Z	OUSD(C) IT Development Initiatives	05	15,653				15,653	U
133 0605075D8Z	CMO Policy and Integration	05	1,618				1,618	U
136 0605210D8Z	Defense-Wide Electronic Procurement Capabilities	05	9,619				9,619	U
137 0605294D8Z	Trusted & Assured Microelectronics	05	175,032				175,032	U
140 0305304D8Z	DoD Enterprise Energy Information Management (EEIM)	05	4,373				4,373	U

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Line No	Program Element Number	Item	Act	FY 2018 (Base + OCO)	FY 2019 Base Enacted	FY 2019 OCO Enacted	FY 2019 Total Enacted	S e c
141	0305310D8Z	CWMD Systems: System Development and Demonstration	05	8,214	17,009		17,009	U
		System Development And Demonstration		506,829	643,501		643,501	
143	0604774D8Z	Defense Readiness Reporting System (DRRS)	06	6,941	6,607		6,607	U
144	0604875D8Z	Joint Systems Architecture Development	06	4,695	4,079		4,079	U
145	0604940D8Z	Central Test and Evaluation Investment Development (CTEIP)	06	204,268	270,013		270,013	U
146	0604942D8Z	Assessments and Evaluations	06	48,985	31,285		31,285	U
148	0605100D8Z	Joint Mission Environment Test Capability (JMETC)	06	90,326	88,184		88,184	U
149	0605104D8Z	Technical Studies, Support and Analysis	06	21,575	22,525		22,525	U
151	0605128D8Z	Classified Program USD(P)	06	138,494	103,000		103,000	U
152	0605142D8Z	Systems Engineering	06	36,313	38,784		38,784	U
153	0605151D8Z	Studies and Analysis Support - OSD	06	5,029	3,534		3,534	U
154	0605161D8Z	Nuclear Matters-Physical Security	06	5,031	5,039		5,039	U
155	0605170D8Z	Support to Networks and Information Integration	06	12,141	11,424		11,424	U
156	0605200D8Z	General Support to USD (Intelligence)	06	165,090	5,693		5,693	U
161	0605502D8Z	Small Business Innovative Research	06	97,227				U

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Line No	Program Element Number	Item	Act	FY 2020 Base	FY 2020 OCO for Base Requirements	FY 2020 OCO for Direct War and Enduring Costs	FY 2020 Total OCO	FY 2020 Total (Base + OCO)	Se c
141	0305310D8Z	CWMD Systems: System Development and Demonstration	05	12,854				12,854	U
		System Development And Demonstration		395,142				395,142	
143	0604774D8Z	Defense Readiness Reporting System (DRRS)	06	9,724				9,724	U
144	0604875D8Z	Joint Systems Architecture Development	06	9,593				9,593	U
145	0604940D8Z	Central Test and Evaluation Investment Development (CTEIP)	06	260,267				260,267	U
146	0604942D8Z	Assessments and Evaluations	06	30,834				30,834	U
148	0605100D8Z	Joint Mission Environment Test Capability (JMETC)	06	83,091				83,091	U
149	0605104D8Z	Technical Studies, Support and Analysis	06	18,079				18,079	U
151	0605128D8Z	Classified Program USD(P)	06						U
152	0605142D8Z	Systems Engineering	06	37,140				37,140	U
153	0605151D8Z	Studies and Analysis Support - OSD	06	4,759				4,759	U
154	0605161D8Z	Nuclear Matters-Physical Security	06	8,307				8,307	U
155	0605170D8Z	Support to Networks and Information Integration	06	9,441				9,441	U
156	0605200D8Z	General Support to USD (Intelligence)	06	1,700				1,700	U
161	0605502D8Z	Small Business Innovative Research	06						U

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166	0605790D8Z	Small Business Innovation Research (SBIR)/ Small Business Technology Transfer	06	2,367	2,539		2,539	U
167	0605797D8Z	Maintaining Technology Advantage	06					U
168	0605798D8Z	Defense Technology Analysis	06	25,815	27,425		27,425	U
171	0605804D8Z	Development Test and Evaluation	06	19,810	20,133		20,133	U
174	0606100D8Z	Budget and Program Assessments	06	3,838	5,755		5,755	U
175	0606225D8Z	ODNA Technology and Resource Analysis	06	998	1,028		1,028	U
179	0203345D8Z	Defense Operations Security Initiative (DOSI)	06	5,479	9,985		9,985	U
184	0303260D8Z	Defense Military Deception Program Office (DMDPO)	06	977	1,003		1,003	U
187	0305245D8Z	Intelligence Capabilities and Innovation Investments	06	15,255	189,529		189,529	U
188	0306310D8Z	CWMD Systems: RDT&E Management Support	06	1,229	1,241		1,241	U
189	0307588D8Z	Algorithmic Warfare Cross Functional Teams	06					U
		Management Support		911,883	848,805		848,805	
199	0607210D8Z	Industrial Base Analysis and Sustainment Support	07	16,464	48,765		48,765	U
200	0607310D8Z	CWMD Systems: Operational Systems Development	07	6,945	5,902		5,902	U
215	0303140D8Z	Information Systems Security Program	07	19,074	17,899		17,899	U

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Line No	Program Element Number	Item	Act	FY 2020 Base	FY 2020 OCO for Base Requirements	FY 2020 OCO for Direct War and Enduring Costs	FY 2020 Total OCO	FY 2020 Total (Base + OCO)	Se
166	0605790D8Z	Small Business Innovation Research (SBIR)/ Small Business Technology Transfer	06	3,568				3,568	U
167	0605797D8Z	Maintaining Technology Advantage	06	19,936				19,936	U
168	0605798D8Z	Defense Technology Analysis	06	16,875				16,875	U
171	0605804D8Z	Development Test and Evaluation	06	22,203				22,203	U
174	0606100D8Z	Budget and Program Assessments	06	8,017				8,017	U
175	0606225D8Z	ODNA Technology and Resource Analysis	06	3,194				3,194	U
179	0203345D8Z	Defense Operations Security Initiative (DOSI)	06	3,037				3,037	U
184	0303260D8Z	Defense Military Deception Program Office (DMDPO)	06	1,014				1,014	U
187	0305245D8Z	Intelligence Capabilities and Innovation Investments	06	21,081				21,081	U
188	0306310D8Z	CWMD Systems: RDT&E Management Support	06						U
189	0307588D8Z	Algorithmic Warfare Cross Functional Teams	06	221,235				221,235	U
		Management Support		793,095				793,095	
199	0607210D8Z	Industrial Base Analysis and Sustainment Support	07	10,051				10,051	U
200	0607310D8Z	CWMD Systems: Operational Systems Development	07	12,734				12,734	U
215	0303140D8Z	Information Systems Security Program	07	67,631				67,631	U

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Line No	Program Element Number	Item	Act	FY 2018 (Base + OCO)	FY 2019 Base Enacted	FY 2019 OCO Enacted	FY 2019 Total Enacted	S e c
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232	0305186D8Z	Policy R&D Programs	07	6,441	6,190		6,190	U
233	0305199D8Z	Net Centricity	07	17,812	16,742		16,742	U
242	0305387D8Z	Homeland Defense Technology Transfer Program	07	2,067	1,137		1,137	U
249	0307577D8Z	Intelligence Mission Data (IMD)	07	13,086	6,889		6,889	U
		Operational System Development		81,889	103,524		103,524	
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		Total Research, Development, Test & Eval, DW		5,364,060	5,829,463		5,829,463	

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Line No	Program Element Number	Item	Act	FY 2020 Base	FY 2020 OCO for Base Requirements	FY 2020 OCO for Direct War and Enduring Costs	FY 2020 Total OCO	FY 2020 Total (Base + OCO)	Se
232	0305186D8Z	Policy R&D Programs	07	6,301				6,301	U
233	0305199D8Z	Net Centricity	07	21,384				21,384	U
242	0305387D8Z	Homeland Defense Technology Transfer Program	07	2,221				2,221	U
249	0307577D8Z	Intelligence Mission Data (IMD)	07						U
		Operational System Development		120,322				120,322	
Total Research, Development, Test & Eval, DW				5,264,901		25,230	25,230	5,290,131	

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3	0601110D8Z	Basic Research Initiatives	01	39,051	56,573		56,573	U
5	0601120D8Z	National Defense Education Program	01	100,850	135,610		135,610	U
6	0601228D8Z	Historically Black Colleges and Universities/Minority Institutions	01	39,006	40,320		40,320	U
		Basic Research		178,907	232,503		232,503	
8	0602000D8Z	Joint Munitions Technology	02	19,053	19,126		19,126	U
11	0602234D8Z	Lincoln Laboratory Research Program	02	47,891	51,479		51,479	U
12	0602251D8Z	Applied Research for the Advancement of S&T Priorities	02	47,550	60,550		60,550	U
16	0602668D8Z	Cyber Security Research	02	14,429	14,935		14,935	U
21	0602751D8Z	Software Engineering Institute (SEI) Applied Research	02	8,614	9,279		9,279	U
		Applied Research		137,537	155,369		155,369	
23	0603000D8Z	Joint Munitions Advanced Technology	03	25,550	25,540		25,540	U
24	0603121D8Z	SO/LIC Advanced Development	03					U
25	0603122D8Z	Combating Terrorism Technology Support	03	149,541	171,321		171,321	U
26	0603133D8Z	Foreign Comparative Testing	03	21,715	24,277		24,277	U
32	0603225D8Z	Joint DoD-DoE Munitions Technology Development	03	17,959	18,602		18,602	U
35	0603288D8Z	Analytic Assessments	03	12,658	18,430		18,430	U
36	0603289D8Z	Advanced Innovative Analysis and Concepts	03	36,763	37,178		37,178	U

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3	0601110D8Z	Basic Research Initiatives	01	48,874				48,874	U
5	0601120D8Z	National Defense Education Program	01	92,074				92,074	U
6	0601228D8Z	Historically Black Colleges and Universities/Minority Institutions	01	30,708				30,708	U
		Basic Research		171,656				171,656	
8	0602000D8Z	Joint Munitions Technology	02	19,306				19,306	U
11	0602234D8Z	Lincoln Laboratory Research Program	02	52,317				52,317	U
12	0602251D8Z	Applied Research for the Advancement of S&T Priorities	02	62,200				62,200	U
16	0602668D8Z	Cyber Security Research	02	15,118				15,118	U
21	0602751D8Z	Software Engineering Institute (SEI) Applied Research	02	9,580				9,580	U
		Applied Research		158,521				158,521	
23	0603000D8Z	Joint Munitions Advanced Technology	03	25,779				25,779	U
24	0603121D8Z	SO/LIC Advanced Development	03	5,000				5,000	U
25	0603122D8Z	Combating Terrorism Technology Support	03	70,517		25,230	25,230	95,747	U
26	0603133D8Z	Foreign Comparative Testing	03	24,970				24,970	U
32	0603225D8Z	Joint DoD-DoE Munitions Technology Development	03	18,773				18,773	U
35	0603288D8Z	Analytic Assessments	03	19,429				19,429	U
36	0603289D8Z	Advanced Innovative Analysis and Concepts	03	37,645				37,645	U

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37	0603291D8Z	Advanced Innovative Analysis and Concepts - MHA	03	14,971	13,590		13,590	U
40	0603342D8Z	Defense Innovation Unit (DIU)	03					U
41	0603375D8Z	Technology Innovation	03	24,825	33,068		33,068	U
43	0603527D8Z	RETRACT LARCH	03	164,544	160,762		160,762	U
44	0603618D8Z	Joint Electronic Advanced Technology	03	14,020	12,889		12,889	U
45	0603648D8Z	Joint Capability Technology Demonstrations	03	102,769	105,808		105,808	U
46	0603662D8Z	Networked Communications Capabilities	03	12,369	12,667		12,667	U
47	0603680D8Z	Defense-Wide Manufacturing Science and Technology Program	03	206,257	174,489		174,489	U
49	0603699D8Z	Emerging Capabilities Technology Development	03	79,469	60,700		60,700	U
51	0603716D8Z	Strategic Environmental Research Program	03	63,055	76,340		76,340	U
53	0603727D8Z	Joint Warfighting Program	03	3,236	5,978		5,978	U
58	0603769D8Z	Distributed Learning Advanced Technology Development	03	11,053	13,564		13,564	U
59	0603781D8Z	Software Engineering Institute	03	14,468	15,016		15,016	U
60	0603826D8Z	Quick Reaction Special Projects	03	64,775	59,490		59,490	U
61	0603833D8Z	Engineering Science & Technology	03	24,447	19,371		19,371	U
62	0603924D8Z	High Energy Laser Advanced Technology Program	03		74,364		74,364	U

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37	0603291D8Z	Advanced Innovative Analysis and Concepts - MHA	03	14,668				14,668	U
40	0603342D8Z	Defense Innovation Unit (DIU)	03	29,398				29,398	U
41	0603375D8Z	Technology Innovation	03	60,000				60,000	U
43	0603527D8Z	RETRACT LARCH	03	159,688				159,688	U
44	0603618D8Z	Joint Electronic Advanced Technology	03	12,063				12,063	U
45	0603648D8Z	Joint Capability Technology Demonstrations	03	107,359				107,359	U
46	0603662D8Z	Networked Communications Capabilities	03	2,858				2,858	U
47	0603680D8Z	Defense-Wide Manufacturing Science and Technology Program	03	96,397				96,397	U
49	0603699D8Z	Emerging Capabilities Technology Development	03	80,911				80,911	U
51	0603716D8Z	Strategic Environmental Research Program	03	66,157				66,157	U
53	0603727D8Z	Joint Warfighting Program	03	4,846				4,846	U
58	0603769D8Z	Distributed Learning Advanced Technology Development	03	13,723				13,723	U
59	0603781D8Z	Software Engineering Institute	03	15,111				15,111	U
60	0603826D8Z	Quick Reaction Special Projects	03	47,147				47,147	U
61	0603833D8Z	Engineering Science & Technology	03	19,376				19,376	U
62	0603924D8Z	High Energy Laser Advanced Technology Program	03	85,223				85,223	U

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63	0603941D8Z	Test & Evaluation Science & Technology	03	108,958	117,389		117,389	U
64	0603950D8Z	National Security Innovation Network	03					U
65	0604055D8Z	Operational Energy Capability Improvement	03	39,788	45,478		45,478	U
66	0303310D8Z	CWMD Systems	03	32,111	26,583		26,583	U
67	0303367D8Z	Spectrum Access Research and Development	03	86,472				U
		Advanced Technology Development		1,331,773	1,322,894		1,322,894	
70	0603161D8Z	Nuclear and Conventional Physical Security Equipment RDT&E ADC&P	04	32,165	28,076		28,076	U
71	0603600D8Z	WALKOFF	04	98,920	92,012		92,012	U
72	0603821D8Z	Acquisition Enterprise Data & Information Services	04	2,194	2,500		2,500	U
73	0603851D8Z	Environmental Security Technical Certification Program	04	53,342	41,925		41,925	U
89	0603920D8Z	Humanitarian Demining	04	10,519	11,262		11,262	U
90	0603923D8Z	Coalition Warfare	04	10,515	8,509		8,509	U
91	0604016D8Z	Department of Defense Corrosion Program	04	4,503	8,458		8,458	U
93	0604132D8Z	Missile Defeat Project	04	121,025	43,508		43,508	U
96	0604250D8Z	Advanced Innovative Technologies	04	1,423,173	1,387,539		1,387,539	U
97	0604294D8Z	Trusted & Assured Microelectronics	04	147,481	522,950		522,950	U
98	0604331D8Z	Rapid Prototyping Program	04	46,984	99,107		99,107	U

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63	0603941D8Z	Test & Evaluation Science & Technology	03	175,574				175,574	U
64	0603950D8Z	National Security Innovation Network	03	25,000				25,000	U
65	0604055D8Z	Operational Energy Capability Improvement	03	70,536				70,536	U
66	0303310D8Z	CWMD Systems	03	28,907				28,907	U
67	0303367D8Z	Spectrum Access Research and Development	03						U
		Advanced Technology Development		1,317,055		25,230	25,230	1,342,285	
70	0603161D8Z	Nuclear and Conventional Physical Security Equipment RDT&E ADC&P	04	42,695				42,695	U
71	0603600D8Z	WALKOFF	04	92,791				92,791	U
72	0603821D8Z	Acquisition Enterprise Data & Information Services	04	5,659				5,659	U
73	0603851D8Z	Environmental Security Technical Certification Program	04	66,572				66,572	U
89	0603920D8Z	Humanitarian Demining	04	10,820				10,820	U
90	0603923D8Z	Coalition Warfare	04	11,316				11,316	U
91	0604016D8Z	Department of Defense Corrosion Program	04	3,365				3,365	U
93	0604132D8Z	Missile Defeat Project	04	17,816				17,816	U
96	0604250D8Z	Advanced Innovative Technologies	04	1,312,735				1,312,735	U
97	0604294D8Z	Trusted & Assured Microelectronics	04	542,421				542,421	U
98	0604331D8Z	Rapid Prototyping Program	04	100,957				100,957	U

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99	0604341D8Z	Defense Innovation Unit (DIU) Prototyping	04					U
100	0604400D8Z	Department of Defense (DoD) Unmanned System Common Development	04	7,839	7,763		7,763	U
101	0604532D8Z	Joint Artificial Intelligence	04		12,970		12,970	U
104	0604682D8Z	Wargaming and Support for Strategic Analysis (SSA)	04	3,686	3,759		3,759	U
106	0604775D8Z	Defense Rapid Innovation Program	04	250,000	249,432		249,432	U
118	0303191D8Z	Joint Electromagnetic Technology (JET) Program	04	2,896	3,097		3,097	U
		Advanced Component Development And Prototypes		2,215,242	2,522,867		2,522,867	
123	0604161D8Z	Nuclear and Conventional Physical Security Equipment RDT&E SDD	05	12,320	8,314		8,314	U
124	0604165D8Z	Prompt Global Strike Capability Development	05	360,860	465,852		465,852	U
126	0604771D8Z	Joint Tactical Information Distribution System (JTIDS)	05	24,268	34,425		34,425	U
130	0605022D8Z	Defense Exportability Program	05	2,088	1,486		1,486	U
131	0605027D8Z	OUSD(C) IT Development Initiatives	05	21,312	9,568		9,568	U
133	0605075D8Z	CMO Policy and Integration	05	2,805	2,100		2,100	U
136	0605210D8Z	Defense-Wide Electronic Procurement Capabilities	05	11,414	6,359		6,359	U
137	0605294D8Z	Trusted & Assured Microelectronics	05	59,516	95,959		95,959	U
140	0305304D8Z	DoD Enterprise Energy Information Management (EEIM)	05	4,032	2,429		2,429	U

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99 0604341D8Z	Defense Innovation Unit (DIU) Prototyping	04	92,000				92,000	U
100 0604400D8Z	Department of Defense (DoD) Unmanned System Common Development	04	3,021				3,021	U
101 0604532D8Z	Joint Artificial Intelligence	04						U
104 0604682D8Z	Wargaming and Support for Strategic Analysis (SSA)	04	3,751				3,751	U
106 0604775D8Z	Defense Rapid Innovation Program	04						U
118 0303191D8Z	Joint Electromagnetic Technology (JET) Program	04	3,191				3,191	U
	Advanced Component Development And Prototypes		2,309,110				2,309,110	
123 0604161D8Z	Nuclear and Conventional Physical Security Equipment RDT&E SDD	05	11,276				11,276	U
124 0604165D8Z	Prompt Global Strike Capability Development	05	107,000				107,000	U
126 0604771D8Z	Joint Tactical Information Distribution System (JTIDS)	05	40,102				40,102	U
130 0605022D8Z	Defense Exportability Program	05	17,615				17,615	U
131 0605027D8Z	OUSDC IT Development Initiatives	05	15,653				15,653	U
133 0605075D8Z	CMO Policy and Integration	05	1,618				1,618	U
136 0605210D8Z	Defense-Wide Electronic Procurement Capabilities	05	9,619				9,619	U
137 0605294D8Z	Trusted & Assured Microelectronics	05	175,032				175,032	U
140 0305304D8Z	DoD Enterprise Energy Information Management (EEIM)	05	4,373				4,373	U

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141	0305310D8Z	CWMD Systems: System Development and Demonstration	05	8,214	17,009		17,009	U
		System Development And Demonstration		506,829	643,501		643,501	
143	0604774D8Z	Defense Readiness Reporting System (DRRS)	06	6,941	6,607		6,607	U
144	0604875D8Z	Joint Systems Architecture Development	06	4,695	4,079		4,079	U
145	0604940D8Z	Central Test and Evaluation Investment Development (CTEIP)	06	204,268	270,013		270,013	U
146	0604942D8Z	Assessments and Evaluations	06	48,985	31,285		31,285	U
148	0605100D8Z	Joint Mission Environment Test Capability (JMETC)	06	90,326	88,184		88,184	U
149	0605104D8Z	Technical Studies, Support and Analysis	06	21,575	22,525		22,525	U
151	0605128D8Z	Classified Program USD(P)	06	138,494	103,000		103,000	U
152	0605142D8Z	Systems Engineering	06	36,313	38,784		38,784	U
153	0605151D8Z	Studies and Analysis Support - OSD	06	5,029	3,534		3,534	U
154	0605161D8Z	Nuclear Matters-Physical Security	06	5,031	5,039		5,039	U
155	0605170D8Z	Support to Networks and Information Integration	06	12,141	11,424		11,424	U
156	0605200D8Z	General Support to USD (Intelligence)	06	165,090	5,693		5,693	U
161	0605502D8Z	Small Business Innovative Research	06	97,227				U

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141	0305310D8Z	CWMD Systems: System Development and Demonstration	05	12,854				12,854	U
		System Development And Demonstration		395,142				395,142	
143	0604774D8Z	Defense Readiness Reporting System (DRRS)	06	9,724				9,724	U
144	0604875D8Z	Joint Systems Architecture Development	06	9,593				9,593	U
145	0604940D8Z	Central Test and Evaluation Investment Development (CTEIP)	06	260,267				260,267	U
146	0604942D8Z	Assessments and Evaluations	06	30,834				30,834	U
148	0605100D8Z	Joint Mission Environment Test Capability (JMETC)	06	83,091				83,091	U
149	0605104D8Z	Technical Studies, Support and Analysis	06	18,079				18,079	U
151	0605128D8Z	Classified Program USD(P)	06						U
152	0605142D8Z	Systems Engineering	06	37,140				37,140	U
153	0605151D8Z	Studies and Analysis Support - OSD	06	4,759				4,759	U
154	0605161D8Z	Nuclear Matters-Physical Security	06	8,307				8,307	U
155	0605170D8Z	Support to Networks and Information Integration	06	9,441				9,441	U
156	0605200D8Z	General Support to USD (Intelligence)	06	1,700				1,700	U
161	0605502D8Z	Small Business Innovative Research	06						U

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166	0605790D8Z	Small Business Innovation Research (SBIR)/ Small Business Technology Transfer	06	2,367	2,539		2,539	U
167	0605797D8Z	Maintaining Technology Advantage	06					U
168	0605798D8Z	Defense Technology Analysis	06	25,815	27,425		27,425	U
171	0605804D8Z	Development Test and Evaluation	06	19,810	20,133		20,133	U
174	0606100D8Z	Budget and Program Assessments	06	3,838	5,755		5,755	U
175	0606225D8Z	ODNA Technology and Resource Analysis	06	998	1,028		1,028	U
179	0203345D8Z	Defense Operations Security Initiative (DOSI)	06	5,479	9,985		9,985	U
184	0303260D8Z	Defense Military Deception Program Office (DMDPO)	06	977	1,003		1,003	U
187	0305245D8Z	Intelligence Capabilities and Innovation Investments	06	15,255	189,529		189,529	U
188	0306310D8Z	CWMD Systems: RDT&E Management Support	06	1,229	1,241		1,241	U
189	0307588D8Z	Algorithmic Warfare Cross Functional Teams	06					U
		Management Support		911,883	848,805		848,805	
199	0607210D8Z	Industrial Base Analysis and Sustainment Support	07	16,464	48,765		48,765	U
200	0607310D8Z	CWMD Systems: Operational Systems Development	07	6,945	5,902		5,902	U
215	0303140D8Z	Information Systems Security Program	07	19,074	17,899		17,899	U

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166	0605790D8Z	Small Business Innovation Research (SBIR)/ Small Business Technology Transfer	06	3,568				3,568	U
167	0605797D8Z	Maintaining Technology Advantage	06	19,936				19,936	U
168	0605798D8Z	Defense Technology Analysis	06	16,875				16,875	U
171	0605804D8Z	Development Test and Evaluation	06	22,203				22,203	U
174	0606100D8Z	Budget and Program Assessments	06	8,017				8,017	U
175	0606225D8Z	ODNA Technology and Resource Analysis	06	3,194				3,194	U
179	0203345D8Z	Defense Operations Security Initiative (DOSI)	06	3,037				3,037	U
184	0303260D8Z	Defense Military Deception Program Office (DMDPO)	06	1,014				1,014	U
187	0305245D8Z	Intelligence Capabilities and Innovation Investments	06	21,081				21,081	U
188	0306310D8Z	CWMD Systems: RDT&E Management Support	06						U
189	0307588D8Z	Algorithmic Warfare Cross Functional Teams	06	221,235				221,235	U
		Management Support		793,095				793,095	
199	0607210D8Z	Industrial Base Analysis and Sustainment Support	07	10,051				10,051	U
200	0607310D8Z	CWMD Systems: Operational Systems Development	07	12,734				12,734	U
215	0303140D8Z	Information Systems Security Program	07	67,631				67,631	U

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232	0305186D8Z	Policy R&D Programs	07	6,441	6,190		6,190	U
233	0305199D8Z	Net Centricity	07	17,812	16,742		16,742	U
242	0305387D8Z	Homeland Defense Technology Transfer Program	07	2,067	1,137		1,137	U
249	0307577D8Z	Intelligence Mission Data (IMD)	07	13,086	6,889		6,889	U
		Operational System Development		81,889	103,524		103,524	
Total Office of Secretary of Defense				5,364,060	5,829,463		5,829,463	

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Program Element Title	Program Element Number	Line #	BA	Page
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Office of the Secretary of Defense (OSD) RDT&E Overview

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

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

The OSD RDT&E budget includes over 90 Program Elements (PEs) in seven budget activities (BA 1-7) ranging from basic research to full scale operational system development. This budget request consists of programs such as hypersonics, artificial intelligence, directed energy, manufacturing institutes, quantum science, combating and countering terrorism, wargaming, Missile defeat, physical security, cyber security, systems engineer, small business interests among many more.

Budget Activities 1, 2 and 3 consists of Science and Technology (S&T) - Basic Research, Applied Research, and Advanced Technology Development which allows the Department of Defense (DoD) to conduct research in areas important to U.S. military capabilities and drives long-term innovation. Approximately 32% of the FY 20 OSD RDT&E President's Budget request is in Science and Technology. Colleges and universities as well as innovation

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and technology are key performers of the S&T activities. These include programs such as research grants, STEM education, laboratory research, innovation & technology, artificial intelligence, directed energy. The remainder of the RDT&E, budget (budget activities 4, 5, 6, and 7) is dedicated to military intelligence, information and weapon systems, technology development, sustainment and support and other various efforts.

The OSD RDT&E Program is committed to and has achieved numerous milestones and individual accomplishments which are presented in the FY 2020 President's Budget justification book.

FY 2020 OSD RDT&E President's Budget request is approximately \$5.3 billion.

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Listing of Acronyms

ACRONYM	DEFINITION
AI	Artificial Intelligence
ARDEC	Army Armament Research, Development, and Engineering Center
AMRDEC	Aviation and Missile Research, Development, and Engineering Center
AT&L	Acquisition Technology and Logistics
C2	Command and Control
C3	Command, Controls, and Communications
C4	Command, Controls, Communications, and Computer
C4I	Command, Controls, Communications, Computer, and Intelligence
C4ISR	Command, Controls, Communications, Computer, Intelligence, Surveillance and Reconnaissance
C4IAS	Command, Controls, Communications, Computer, and Intelligence Automation System
CBRNE	Chemical, Biological, Radiological, Nuclear, and high-yield Explosives
CIED	Counter-Improvised Explosive Device
CND	Computer Network Defense
COCOMs	Combatant Commands
CTTSO	Combating Terrorism Technical Support Office
CWMD	Countering Weapons of Mass Destruction
DARPA	Defense Advanced Research Projects Agency
DE	Directed Energy
DIU	Defense Innovation Unit
DIUx	Defense Innovation Unit Experimental
DOD	Department of Defense
DPPG	Defense Policy and Planning Guidance
DTRA	Defense Threat Reduction Agency
DTRMC	Defense Test Resource Management Center
DT&E	Development, Test and Evaluation
EDTC	Engineering and Development Test Center
EMP	Electromagnetic Pulse
EMREP	Electromagnetic Reliability and Effects Predictions
EOD	Explosive Ordnance Disposal
ESTCP	Environmental Security Technology Certification Program
FATGS	Fuze Area Technology Groups
FCT	Foreign Comparative Testing
FFRDC	FFRDC Federally Funded Research and Development Center
GCC	Global Command and Control

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Listing of Acronyms

GKMC	Global Knowledge Management System
HARP	High Altitude Radiological Phenomenology
HBCU/MI	Historically Black Colleges and Universities and Minority Institutions
HPCMP	High Performance Computing Modernization Program
HSBC	Human Social Culture Behavior
IED	Improvised Explosive Device
IM	Insensitive Munitions
IMD	Intelligence Mission Data
IOC	Initial Operational Capability
IoT	Internet of Things
IPODS	Integrated Precision Ordnance Delivery System
ISR	Intelligence, Surveillance, Reconnaissance
ISS	Integrated Sensor System
ISSP	Information Systems Security Program
IWS	Irregular Warfare Support
ITD	Integrated Technology Demonstration
JAIC	Joint Artificial Intelligence Center
JCIDS	Joint Capabilities Integration and Development System
JCTD	Joint Concept Technology Demonstration
JFTP	Joint Fuze Technology Program
JIEDDO	Joint Improvised Explosive Device Defeat Organization
JIMTP	Joint Insensitive Munitions Technology Program
JRAC	Joint Rapid Acquisition Cell
JUON/JEON	Joint Urgent Operational Needs / Joint Emergent Operational Needs
LUCI	Laboratory University Collaboration Initiative
M&S	Modeling and Simulation
MATGs	Munition Area Technology Groups
MDDE	Missile Defeat Defense Enhancement
MEMS	MEMS - MicroElectro-Mechanical Systems (MEMS)
MCPP	Military Child Pilot Program
MIL STD	Military Standard
MRL	MRL - Manufacturing Readiness Level
NDAA	National Defense Authorization Act
NDEP	National Defense Education Program
NDS	National Defense Strategy
NSSEFF	National Security Science and Engineering Faculty Fellowship
NWC	Nuclear Weapons Council

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Listing of Acronyms

OCO	Overseas Contingency Operations
OCONUS	Outside the Continental United States
OLED	Organic Light Emitting Diode
OSD	Office of the Secretary of Defense
OSTP	Office of Science and Technology Policy
PEO	Program Executive Officers
QDR	Quadrennial Defense Review
RDT&E	Research Development Test and Evaluation
RHBD	Radiation Hardened by Design
RHM	Radiation Hardened Microelectronics
ROI	Return on Investments
S&E	Scientists and Engineers
S&T	Science & Technology
SBIR	Small Business Innovative Research
SCO	Strategic Capabilities Office
SMART	Science, Mathematics, and Research for Transformation
SOF	Special Operations Forces
SSBR	Strategic Support for Basic Research
STEM	Science, Technology, Engineering, and Mathematics
STTR	Small Business Technology Transfer
TEAMS	Technical Evaluation Assessment and Monitor Site
THAAD	Terminal High Altitude Area Defense
TOA	Total Obligation Authority
TRAC	Threat Reduction Advisory Committee
TRL	Technology Readiness Level
UAS	Unmanned Aerial Systems
USD/A&S	Under Secretary of Defense for Acquisition and Sustainment
USD/R&E	Under Secretary of Defense for Research and Engineering
USG	USG United States Government
USNORTHCOM	U.S. Northern Command
USPACOM	U.S. Pacific Command
USSOCOM	U.S. Special Operations Command
USSTRATCOM	U.S. Strategic Command
UXO	Unexploded Ordnance
WMD	Weapons of Mass Destruction
WSMR	White Sands Missile Range

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: March 2019
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Appropriation/Budget Activity					R-1 Program Element (Number/Name)							
0400: Research, Development, Test & Evaluation, Defense-Wide / BA 1: Basic Research					PE 0601110D8Z / Basic Research Initiatives							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	39.051	56.573	48.874	-	48.874	45.935	46.713	47.585	48.596	Continuing	Continuing
010: Basic Research Initiatives	-	11.960	27.023	14.577	-	14.577	14.076	14.315	14.580	14.891	Continuing	Continuing
060: Vannevar Bush Faculty Fellowship	-	27.091	29.550	34.297	-	34.297	31.859	32.398	33.005	33.705	Continuing	Continuing

A. Mission Description and Budget Item Justification

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

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

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	40.612	42.702	45.253	-	45.253
Current President's Budget	39.051	56.573	48.874	-	48.874
Total Adjustments	-1.561	13.871	3.621	-	3.621
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	14.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-1.483	-			
• FFRDC Reduction	-0.078	-0.129			
• Internal Program Adjustments	-	-	3.750	-	3.750
• Other Program Adjustments	-	-	-0.129	-	-0.129

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

Project: 010: Basic Research Initiatives

FY 2018	FY 2019

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense		Date: March 2019	
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) Congressional Add: Program Increase for Minerva Research Initiative and Defense Experimental Program to Stimulate Competitive Research (DEPSCoR)		FY 2018	FY 2019
Congressional Add Subtotals for Project: 010		-	13.960
Congressional Add Totals for all Projects		-	13.960
Change Summary Explanation FY 2020 internal program adjustments will support the Laboratory University Collaboration Initiative (LUCI) executed under Project 060 and the I-Corps@DoD program executed under Project 010, Strategic Support for Basic Research. Internal program adjustments are consistent with higher priority DoD requirements.			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: March 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
010: Basic Research Initiatives	-	11.960	27.023	14.577	-	14.577	14.076	14.315	14.580	14.891	Continuing	Continuing

A. Mission Description and Budget Item Justification

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

SSBR supports oversight, policies, and initiatives to implement the Under Secretary of Defense for Research and Engineering's (USD(R&E)) strategic plan for defense basic research. This plan defines actions to help create conditions for defense basic research investments capable of producing high-payoff, transformative scientific breakthroughs for the Department. SSBR initiatives support the five Basic Research Office strategic goals: (1) drive the direction of DoD basic research investments; (2) coordinate and conduct oversight of DoD basic research programs; (3) improve the science and engineering workforce and public outreach; (4) enhance university-industry collaboration; and (5) engage with the academic research community and international partners.

The Minerva Research Initiative, a Department of Defense basic research program in the social sciences directed by the Office of the Secretary of Defense (OSD), funded in partnership with Air Force and Navy University Research Initiatives, and executed by the Office of Naval Research and the Air Force Office of Scientific Research, seeks to build a fundamental understanding of the sources of present and future conflict. It is one of the Nation's only social science basic research programs in support of national security. Minerva promotes a deeper understanding of the social and cultural environments, where threats such as radicalization and regional instabilities develop, and supports more effective strategic and operational policy decisions. Minerva program priorities are consistent with the goals set forth in the 2018 National Defense Strategy (NDS), informing DoD efforts to effectively build security globally, and are updated annually according to inputs from across the defense enterprise.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
Title: Strategic Support for Basic Research (SSBR)	2.211	2.312	3.163
Description: The SSBR program creates conditions for defense basic research investments capable of producing high-payoff, transformative scientific breakthroughs for the Department. SSBR initiatives support the five Basic Research Office strategic goals: (1) drive the direction of DoD basic research investments; (2) coordinate and conduct oversight of DoD basic research programs; (3) improve the science and engineering (S&E) workforce and public outreach; (4) enhance university-industry collaboration; and (5) engage with the academic research community and international partners.			
FY 2019 Plans: Conduct four to six workshops for scientific situational awareness that were planned in previous fiscal years. Convene national research leaders to provide expert perspectives on potential breakthroughs and barriers of advancement in rapidly evolving fields of basic research. Establish a Dean's Roundtable to provide a forum for university and DoD leaders to engage on cutting edge research topics, preventing research espionage, and promoting rapid innovation. Continue studies of how past DoD investments and high priority basic research has led to advances in new technologies and new capabilities for the Nation. As part of the USD(R&E) mission, continue to analyze university-related business practices for improvement and efficiency. Continue support			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: March 2019		
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 2018	FY 2019	FY 2020
for scientific expertise to oversee science and engineering initiatives. Evaluate effectiveness of Defense Enterprise Science Initiative (DESI) and I-Corps pilot programs. Improve awareness of DoD basic research programs through outreach and site visits to performers in the national basic research enterprise, public events such as the Science, Technology, and Innovation Exchange (STIx) conference, and by overhauling public platforms such as the Basic Research Office website to improve information dissemination and access. FY 2020 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 second year of the Dean’s Roundtable. Continue studies of the effectiveness of past DoD investments and high priority basic research in advancing new technologies and new capabilities for the Nation. As part of the USD(R&E) mission, continue to analyze university-related business practices for improvement and efficiency and support for scientific expertise to oversee science and engineering initiatives. Organize and execute a competition for the I-Corps@DoD program, and conduct a review of I-Corps projects. Continue to iteratively refine communication and outreach efforts, such as site visits and the STIx #conference to increase awareness of DoD basic research programs. FY 2019 to FY 2020 Increase/Decrease Statement: The increase from FY 2019 to FY 2020 supports SSBR workshops and studies, and 10 I-Corps teams.				
Title: Minerva Research Initiative 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 Research for Defense Education Faculty (R-DEF) program for the professional military education (PME) institutions; and (3) a collaboration with the Congressionally-established United States Institute of Peace to award research support to advanced graduate students and early career scholars working on security and peace. All components contribute to Minerva's goals of revitalizing connections between DoD and academic social science communities and building cultural and foreign area knowledge on topics ranging from the mechanisms of radicalization 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 2019 Plans: Continue to support successful ongoing university-led research projects and execute 12-14 new projects based on input from DoD stakeholders. Encourage more partnerships between university-led and R-DEF projects. Continue active engagement with operational community by providing subject matter expertise on request and through the annual Minerva Conference and outreach to DoD stakeholders. Retain existing and generate new connections to policy and operational communities to facilitate		9.749	10.751	11.414

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: March 2019	
Appropriation/Budget Activity 0400 / 1	R-1 Program Element (Number/Name) PE 0601110D8Z / <i>Basic Research Initiatives</i>	Project (Number/Name) 010 / <i>Basic Research Initiatives</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
the transition of Minerva research. Effectively connect new social science discoveries and analytical methods to current and future defense leadership and to inform future security decisions.			
FY 2020 Plans: Continue to support successful ongoing university-led research projects and execute 10-12 new projects based on input from DoD stakeholders. Encourage more partnerships between university-led and R-DEF projects. Continue active engagement with operational community by providing subject matter expertise on request and through the annual Minerva Conference and outreach to DoD stakeholders. Retain existing and generate new connections to policy and operational communities to facilitate the transition of Minerva research. Effectively connect new social science discoveries and analytical methods to current and future defense leadership and to inform future security decisions.			
FY 2019 to FY 2020 Increase/Decrease Statement: The increase from FY 2019 to FY 2020 supports university-led research projects within the Minerva Research Initiative.			
Accomplishments/Planned Programs Subtotals		11.960	13.063
		FY 2018	FY 2019
Congressional Add: Program Increase for Minerva Research Initiative and Defense Experimental Program to Stimulate Competitive Research (DEPSCoR)		-	13.960
FY 2019 Plans: Continue to support successful ongoing university-led research projects and execute 12-15 new projects based on input from DoD stakeholders. This includes additional projects aligned with recent Congressional interest, such as those on peer and near-peer statecraft, supported by the Congressional increase to the Minerva budget.			
Defense Experimental Program to Stimulate Competitive Research (DEPSCoR) is a legislated program that helps build the national infrastructure for research and education by funding research activities in science and engineering (S&E) responsive to the needs of national defense. Participation in this program is limited to states that meet eligibility criteria as outlined in the authorizing language. The program is intended to increase the number of university researchers and improve the capabilities of institutions of higher education (IHEs) in eligible jurisdictions to perform competitive S&E research relevant to the Department. IHEs in eligible states will be invited to compete for awards in areas identified by the Department in broad agency announcements.			
Congressional Adds Subtotals		-	13.960
C. Other Program Funding Summary (\$ in Millions)			
N/A			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: March 2019
Appropriation/Budget Activity 0400 / 1	R-1 Program Element (Number/Name) PE 0601110D8Z / <i>Basic Research Initiatives</i>	Project (Number/Name) 010 / <i>Basic Research Initiatives</i>
C. Other Program Funding Summary (\$ in Millions)		
Remarks		
D. Acquisition Strategy		
N/A		
E. Performance Metrics		
N/A		

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: March 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
060: Vannevar Bush Faculty Fellowship	-	27.091	29.550	34.297	-	34.297	31.859	32.398	33.005	33.705	Continuing	Continuing

A. Mission Description and Budget Item Justification

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

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
Title: Vannevar Bush Faculty Fellowship (VBFF) Program	27.091	29.550	34.297
Description: The Vannevar Bush Program ensures the DoD has a research portfolio that supports creative, innovative, and productive university researchers. The objectives of the program are to: (1) support scientific research that may lead to extraordinary outcomes; (2) educate and train student and post-doctoral researchers for the defense and national security workforce; (3) foster long-term relationships between university researchers and the Department; (4) familiarize select university researchers and their students with DoD's current and future challenges through research and engagement with DoD-employed scientists; and (5) increase the number of exceptionally talented technical experts that are contributing to DoD's mission.			
FY 2019 Plans: Support 55 Vannevar Bush Fellows and collaborative research efforts with 36 Laboratory University Collaboration Initiative (LUCI) Fellows from DoD Service Laboratories. LUCI fellows engage in a three-year basic research collaboration between Vannevar Bush Fellows in fields of critical interest to the Department. Review and update program focus topic areas with input from DoD S&T community. Organize and execute a competition to select a new class of Vannevar Bush Fellows. Organize and conduct the Vannevar Bush annual meeting, including DoD laboratory tours. Facilitate connections between new Fellows and DoD scientists and engineers. Organize and conduct a program review and site visits to monitor the research progress by Vannevar Bush Fellows and their DoD collaborators. Conduct review of LUCI projects in DoD laboratories and report the scientific progress and impacts.			
FY 2020 Plans: Support 55 Vannevar Bush Fellows and collaborative research efforts with 25 Laboratory University Collaboration Initiative (LUCI) Fellows from DoD Service Laboratories. LUCI fellows engage in a three-year basic research collaboration between Vannevar Bush Fellows in fields of critical interest to the Department. Review and update program focus topic areas with input from DoD			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: March 2019	
Appropriation/Budget Activity 0400 / 1	R-1 Program Element (Number/Name) PE 0601110D8Z / <i>Basic Research Initiatives</i>	Project (Number/Name) 060 / <i>Vannevar Bush Faculty Fellowship</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>S&T community. Organize and execute a competition to select a new class of Vannevar Bush Fellows. Organize and conduct the Vannevar Bush annual meeting, including DoD laboratory tours. Facilitate connections between new Fellows and DoD scientists and engineers. Organize and conduct a program review and site visits to monitor the research progress by Vannevar Bush Fellows and their DoD collaborators. Organize and execute a competition for the LUCI program. Conduct review of LUCI projects in DoD laboratories and report the scientific progress and impacts. Organize a study group to introduce and educate Vannevar Bush Faculty Fellows to national security challenges.</p> <p><i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> The FY 2019 to FY 2020 increase supports a study group to introduce and educate Vannevar Bush Faculty Fellows to national security challenges, and also provides support to five (5) new LUCI fellows.</p>			
Accomplishments/Planned Programs Subtotals		27.091	29.550
C. Other Program Funding Summary (\$ in Millions)			
N/A			
Remarks			
D. Acquisition Strategy			
N/A			
E. Performance Metrics			
N/A			

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity					R-1 Program Element (Number/Name)							
0400: Research, Development, Test & Evaluation, Defense-Wide / BA 1: Basic Research					PE 0601120D8Z / National Defense Education Program (NDEP)							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	100.850	135.610	92.074	-	92.074	99.145	107.804	110.929	113.279	Continuing	Continuing
120: National Defense Education Program (NDEP)	-	100.850	135.610	92.074	-	92.074	99.145	107.804	110.929	113.279	Continuing	Continuing

A. Mission Description and Budget Item Justification

The National Defense Education Program (NDEP) fosters and enhances the Department of Defense's (DoD) ability to access high-quality science, technology, engineering, and mathematics (STEM) personnel vital to national defense now and in the future. NDEP is executed by the Office of the Under Secretary of Defense for Research and Engineering (USD(R&E)). NDEP's portfolio includes workforce development programs, such as the Science, Mathematics, and Research for Transformation (SMART) program; Military family programs, such as the Military Child Pilot Program (MCPPI); STEM Education and Outreach; and the Manufacturing Engineering Education Program (MEEP). These programs provide a pathway to the best and the brightest minds through a continuum of DoD workforce development approaches, which include: (1) increasing STEM proficiency in the Nation by enabling an increased capacity to address ever-changing future defense workforce needs; (2) shaping the Department as a STEM workplace of choice for scientists and engineers through programs and outreach; (3) leading the Departmental STEM strategic efforts and coordinating STEM efforts in alignment with the workforce and mission requirements; and (4) identifying approaches for innovative solutions in support of the Nation's current and future defense challenges.

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

The SMART program awards highly competitive scholarships-for-service to undergraduate and graduate students in 21 STEM academic disciplines and hires the students, upon graduation, into DoD's workforce. As part of the SMART experience, scholars engage in internships that allow for relevant hands-on research and work experiences in DoD facilities, thereby enhancing their educational experience. Since its inception as a pilot program in FY 2005, SMART has awarded approximately 2,800 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 have completed their service commitment to the Department. SMART ensures the Department has a steady infusion of high-quality technical talent, prepared in areas of critical importance to DoD, and ready to apply their technical knowledge, skills, and abilities to fulfill DoD's mission.

The MCPPI enhances the preparation of dependents of members of the Armed Forces for careers in STEM and provides assistance to STEM teachers at elementary or secondary schools at which a significant number of military dependents are enrolled. Section 233 of the National Defense Authorization Act (NDAA) for FY 2015, and the Consolidated and Further Continuing Appropriations Act, 2015, authorized the establishment of this Pilot Program.

STEM Education and Outreach fosters activities to support and cultivate STEM talent with minds for innovation, diversity of thought, and the technical agility to sustain the Department's competitive edge. In order to build a necessary workforce that brings in an expansion of ideas to solve national defense needs and challenges, the

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I</i> BA 1: <i>Basic Research</i>	R-1 Program Element (Number/Name) PE 0601120D8Z <i>I National Defense Education Program (NDEP)</i>
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DoD recognizes the need for increased participation of underserved groups in STEM activities and education programs. Initiatives include investing, promoting, and participating in national-level STEM programs and efforts, as well as providing authentic hands-on STEM experiences for students and teachers across the Nation.

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

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	74.298	85.919	92.338	-	92.338
Current President's Budget	100.850	135.610	92.074	-	92.074
Total Adjustments	26.552	49.691	-0.264	-	-0.264
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	29.000	50.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-2.305	-			
• FFRDC Reduction	-0.143	-0.309	-	-	-
• Other Program Adjustments	-	-	-0.264	-	-0.264

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

Project: 120: *National Defense Education Program (NDEP)*

 Congressional Add: *Manufacturing Engineering Education Program (MEEP)*

 Congressional Add: *STEM Education Program Increase*

Congressional Add Subtotals for Project: 120

Congressional Add Totals for all Projects

FY 2018	FY 2019
26.552	15.000
-	34.691
26.552	49.691
26.552	49.691

C. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
Title: Workforce Development - Science, Mathematics, and Research for Transformation (SMART) Defense Education Program	58.682	67.858	71.004
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 needed by DoD.			

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I</i> BA 1: <i>Basic Research</i>		R-1 Program Element (Number/Name) PE 0601120D8Z <i>I National Defense Education Program (NDEP)</i>		
C. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<p>The disciplines align with the Department's Science and Technology (S&T) priorities and emerging scientific research areas, and include: Aeronautical and Astronautical Engineering; Biomedical Engineering; Biosciences; Chemical Engineering; Chemistry; Civil Engineering; Cognitive, Neural, and Behavioral Sciences; Computer Science; Electrical Engineering; Environmental Sciences; Geosciences; Industrial and Systems Engineering; Information Sciences; Materials Science and Engineering; Mathematics; Mechanical Engineering; Naval Architecture and Ocean Engineering; Nuclear Engineering; Oceanography; Operations Research; and Physics. Upon completion of their degree, students fulfill a service commitment to the Department on a one-to-one payback per year of education funded. In part, SMART's success is measured by participants that choose to remain in the DoD workforce beyond their required service commitment. Approximately 1,200 participants have successfully completed the program through their DoD Service commitment, of which 70 percent of those participants are still employed by DoD.</p> <p>Oversight of the SMART program falls under the Office of the Under Secretary of Defense for Research and Engineering (USD(R&E)). Two types of individuals participate in the program: (1) retention scholars who are current DoD employees; and (2) recruitment scholars who are college students enrolled in undergraduate and graduate programs and represent new talent for the Department. Internships provide SMART scholars with an opportunity to engage in relevant hands-on research and work experiences in defense laboratories, thereby enhancing their educational experience.</p> <p>Since FY 2005, approximately 2,800 students have participated in the SMART program at approximately 190 sponsoring facilities. As of October 2018, approximately 2,000 SMART scholars have transitioned into the service commitment phase. To date, these scholars have transitioned as civilian employees into the Air Force, Army, Navy, and other DoD components.</p> <p>FY 2019 Plans:</p> <ul style="list-style-type: none"> • Allocate SMART awards to better meet the technical needs of the Department's STEM workforce. • Focus nine percent of the awards on disciplines supporting the advancement of Artificial Intelligence, Microelectronics, and Hypersonics within the DoD. • Implement a robust recruitment effort to ensure the Department continues to meet the increasing needs of the DoD STEM workforce. • Conduct a SMART Symposium to continually enhance inter-Service collaboration. <p>FY 2020 Plans:</p> <ul style="list-style-type: none"> • Continue to make SMART awards to meet the technical needs of the Department's STEM workforce. • Implement a robust recruitment effort focusing on disciplines supporting the advancement of Artificial Intelligence, Microelectronics, and Hypersonics within the DoD to ensure the Department continues to meet the increasing needs of the DoD STEM workforce. 				

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
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 2018	FY 2019	FY 2020
<ul style="list-style-type: none"> Conduct a SMART Symposium to continually enhance inter-Service collaboration. 				
FY 2019 to FY 2020 Increase/Decrease Statement: Additional funding will support a five percent increase in new SMART awards to help meet the DoD's workforce needs.				
Title: Military Families - Pilot Program to Enhance the Preparation of Dependents of Members of the Armed Forces for Careers in STEM (Military Child Pilot Program) Description: The Military Child Pilot Program was formally established by the FY 2015 National Defense Authorization Act (NDAA), Section 233, and the Consolidated and Further Continuing Appropriations Act, 2015. The objectives of the program are to enhance the preparation of dependents of members of the armed forces for careers in STEM and to provide assistance to STEM teachers at elementary or secondary schools at which a significant number of military dependents are enrolled. The Department currently provides in-classroom STEM program support to students and teachers in covered schools.		10.560	11.281	11.483
FY 2019 Plans: <ul style="list-style-type: none"> The Department will target military-dependent students, their teachers, and their families through in-classroom and out-of-school programs to provide additional STEM resources, greater awareness of DoD STEM opportunities and careers, and reach a younger military child population. In coordination with the DoD Components, complete the FY 2018 NDAA Section 553 report on educational opportunities in STEM for dependents of members of the Armed Forces. 				
FY 2020 Plans: <ul style="list-style-type: none"> The Department will target military-dependent students, their teachers, and their families through in-classroom and out-of-school programs to provide additional STEM resources, greater awareness of DoD STEM opportunities and careers, and reach a younger military child population. 				
FY 2019 to FY 2020 Increase/Decrease Statement: An increase in funding will be used to reach an increased number of military children.				
Title: STEM Education and Outreach Description: STEM Education and Outreach fosters activities to support and cultivate STEM talent with minds for innovation, diversity of thought, and the technical agility to sustain the Department's competitive edge. In order to build a necessary workforce that brings in an expansion of ideas to solve national defense needs and challenges, the DoD recognizes the need for increased participation of underserved groups in STEM activities and education programs. Investments are made to promote participation in national-level STEM programs and initiatives and provide authentic hands-on experiences for students and teachers across the globe. STEM Education and Outreach manages activities, in support of the Department's STEM Strategic Plan, to assist in attracting, inspiring, and developing exceptional STEM talent across the education continuum that include		5.056	6.780	9.587

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
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 2018	FY 2019	FY 2020
internships, robotics and math competitions, and mentorships through partnerships with industry. STEM Education and Outreach develops and maintains systems and standards to support its programs, implementing the DoD STEM Communications Strategy and collaborating across the Federal government and public domain through interagency and intra-departmental working groups and partnerships. FY 2019 Plans: <ul style="list-style-type: none">• Continue STEM Education and Outreach activities that provide authentic hands-on experiences to students and teachers and evaluate the effectiveness of the increased outreach.• Participate in inter- and intra-departmental collaboration with program partners to achieve federal and DoD STEM objectives.• Update the Department’s STEM Strategic Plan.• Implement joint framework to increase access to STEM program-level outcome data for oversight and evaluation of DoD-wide STEM programs and investments, making evidence-based adjustments and improvements. FY 2020 Plans: <ul style="list-style-type: none">• Continue STEM Education and Outreach activities that provide authentic hands-on experiences to students and teachers and evaluate the effectiveness of the increased outreach.• Participate in inter- and intra-departmental collaboration with program partners to achieve federal and DoD STEM objectives.• Finalize the Department’s new STEM Strategic Plan. FY 2019 to FY 2020 Increase/Decrease Statement: The increase will support additional STEM Education and Outreach programs to help meet future DoD workforce needs.				
Accomplishments/Planned Programs Subtotals		74.298	85.919	92.074
		FY 2018	FY 2019	
Congressional Add: Manufacturing Engineering Education Program (MEEP) FY 2018 Accomplishments: • Published a funding opportunity announcement with specific community college and academia initiatives within manufacturing engineering. • With support from the DoD Manufacturing Technology Program Office, issued a funding opportunity announcement for the manufacturing institutes.		26.552	15.000	

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide / BA 1: Basic Research</i>		R-1 Program Element (Number/Name) PE 0601120D8Z / <i>National Defense Education Program (NDEP)</i>	
		FY 2018	FY 2019
<ul style="list-style-type: none"> With support from the DoD Components, issued a funding opportunity announcement for Manufacturing Engineering Education pilot programs. 			
FY 2019 Plans: • Publish a new funding opportunity announcement with specific community college and academia initiatives within manufacturing engineering.			
Congressional Add: STEM Education Program Increase		-	34.691
FY 2019 Plans: Expand on existing STEM education and outreach programs <ul style="list-style-type: none"> Defense STEM Education Consortium Cooperative Agreement STEM Education BAA or FOA Component STEM Pilot Programs Support the Barry Goldwater Foundation Scholarships for DoD related disciplines 			
Congressional Adds Subtotals		26.552	49.691
D. Other Program Funding Summary (\$ in Millions) N/A			
Remarks			
E. Acquisition Strategy N/A			
F. Performance Metrics Current metrics are subject to ongoing evaluation and analysis of appropriateness and effectiveness of the metrics being performed. <ul style="list-style-type: none"> The increase in the number of SMART scholars who are transitioned into the DoD workforce. - In FY 2018, 175 Scholars were hired by the Department. The number of SMART scholars who are retained by DoD post-service commitment. - Since 2006, 833 participants have been retained post service commitment, a 70% rate for the program. Participation by underserved populations; and where applicable course completions and credentials received. SMART FY 2018 Gender: Female: 32% Male: 66%			

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
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)	
<div>Do not wish to be identified: 2%</div> <div>Ethnicity: Not Hispanic: 89% Hispanic: 7% Do not wish to be identified: 4%</div> <div>Race American Indian or Alaska Native: 1% Asian: 11% Black: 7% Native Hawaiian or Other Pacific Islander: 1% White: 81% Do not wish to be identified: 4%</div> <div><ul style="list-style-type: none">The number of SMART application reviewers from HBCU/MIs.There are currently 7 reviewers from HBCU/MIs.</div>		

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity	R-1 Program Element (Number/Name)											
0400: Research, Development, Test & Evaluation, Defense-Wide / BA 1: Basic Research	PE 0601228D8Z / Historically Black Colleges and Universities and Minority-Serving Institutions											
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	39.006	40.320	30.708	-	30.708	31.261	31.791	32.386	33.074	Continuing	Continuing
448: Historically Black Colleges and Universities and Minority-Serving Institutions	-	39.006	40.320	30.708	-	30.708	31.261	31.791	32.386	33.074	Continuing	Continuing

A. Mission Description and Budget Item Justification

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

Work in this PE provides a foundation to enhance participation of HBCUs/MIs in DoD research, including 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 important to the national defense; 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 COEs in Autonomy, Cyber Security, Research Data Analysis, and STEM Scholars.

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	25.865	30.412	30.796	-	30.796
Current President's Budget	39.006	40.320	30.708	-	30.708
Total Adjustments	13.141	9.908	-0.088	-	-0.088
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	14.135	10.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.944	-			
• FFRDC Reduction	-0.050	-0.092	-	-	-
• Other Program Adjustments	-	-	-0.088	-	-0.088

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 1: Basic Research</i>		R-1 Program Element (Number/Name) PE 0601228D8Z I <i>Historically Black Colleges and Universities and Minority-Serving Institutions</i>	
Congressional Add Details (\$ in Millions, and Includes General Reductions)		FY 2018	FY 2019
Project: 448: <i>Historically Black Colleges and Universities and Minority-Serving Institutions</i>			
Congressional Add: <i>HBCU/MI Program Increase</i>		14.135	10.000
Congressional Add Subtotals for Project: 448		14.135	10.000
Congressional Add Totals for all Projects		14.135	10.000

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 1					R-1 Program Element (Number/Name) PE 0601228D8Z / <i>Historically Black Colleges and Universities and Minority-Serving Institutions</i>				Project (Number/Name) 448 / <i>Historically Black Colleges and Universities and Minority-Serving Institutions</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
448: <i>Historically Black Colleges and Universities and Minority-Serving Institutions</i>	-	39.006	40.320	30.708	-	30.708	31.261	31.791	32.386	33.074	Continuing	Continuing

A. Mission Description and Budget Item Justification

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

- Research. The research grants are to further the 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 2018	FY 2019	FY 2020
Title: Historically Black Colleges and Universities and Minority-Serving Institutions (HBCU/MI)	24.871	30.320	30.708
Description: The HBCU/MI program provides support for research and collaboration with DoD facilities and personnel. The research grants further knowledge in the basic physical scientific and engineering disciplines through theoretical and empirical activities. Collaborative research allows university professors to work directly with DoD laboratories or other universities.			
FY 2019 Plans:			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 1	R-1 Program Element (Number/Name) PE 0601228D8Z / <i>Historically Black Colleges and Universities and Minority-Serving Institutions</i>	Project (Number/Name) 448 / <i>Historically Black Colleges and Universities and Minority-Serving Institutions</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
<p>Continue efforts from FY 2018. Conduct annual competition of the HBCU/MI program for equipment/instrumentation. Plan to increase the number of FY 2018 summer interns and faculty research fellows from 100 to 110 participants. Monitor established Centers of Excellence in support of the USD(R&E) Science and Technology priorities in the areas of Cyber Security, Research Data Analysis, Autonomy, and the Center for STEM Scholars, needed to expand STEM opportunities for underrepresented minorities. Conduct annual review of the Centers. Host outreach activities, to include one webinar and two technical assistance workshops to expose HBCUs/MIs to opportunities in DoD.</p> <p>FY 2020 Plans: Continue efforts from FY 2019. Conduct annual competition of the HBCU/MI program for basic research, student support, and/or equipment/instrumentation. Continue research and educational collaboration with the DoD laboratories. Monitor established Centers of Excellence in support of the USD(R&E) Science and Technology priorities in the areas of Cyber Security, Research Data Analysis, Autonomy, and the Center for STEM Scholars, needed to expand STEM opportunities for underrepresented minorities. Conduct annual review of the Centers. Host outreach activities, to include one webinar and two technical assistance workshops to expose HBCUs/MIs to opportunities in DoD.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: The level of effort is consistent between FY 2019 and FY 2020. Small changes reflect minor budget fluctuations.</p>			
Accomplishments/Planned Programs Subtotals	24.871	30.320	30.708

	FY 2018	FY 2019
<p>Congressional Add: HBCU/MI Program Increase</p> <p>FY 2018 Accomplishments: The FY 2018 congressional increase of \$14.135 million supported HBCU/MI program expansion and STEM efforts for minority women.</p> <p>Established Center of Excellence for STEM Scholars supporting a cohort of 16 students at Hampton University to pursue degrees in STEM disciplines important to the defense mission. Awarded 45 single-investigator research grants with student support for a total of \$25.8 million based on the FY 2018 HBCU/MI Research and Education Program funding opportunity announcement. Placed 70 HBCU/MI student interns and 30 faculty fellows at Army, Navy and Air Force research laboratories. Issued FY 2019 HBCU/MI funding opportunity announcement for equipment/instrumentation enhancements. Hosted a one-day HBCU/MI proposal and application writing workshop, attended by 210 HBCU/MI representatives. Conducted ten campus outreach visits to HBCUs/MIs. Participated in congressional delegation site visit to five HBCUs funded under the HBCU/MI program. Developed FY 2018 Agency Plan in response to the White House Initiative on Historically Black</p>	14.135	10.000

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 1	R-1 Program Element (Number/Name) PE 0601228D8Z / <i>Historically Black Colleges and Universities and Minority-Serving Institutions</i>	Project (Number/Name) 448 / <i>Historically Black Colleges and Universities and Minority-Serving Institutions</i>	
		FY 2018	FY 2019
Colleges and Universities (WHIHBCU), and Executive Order 13779, detailing DoD efforts to strengthen the capacity and competitiveness of HBCUs to participate in federal opportunities. Aligned the DoD WHIHBCU Plan with the ten USD(R&E) priorities and the National Defense Strategy. Monitored Center of Excellence in Autonomy, Cyber Security, and Research Data Analytics to assess the expansion of education and training for faculty and students. Hosted a research colloquium and poster workshop for DoD summer interns and faculty fellows to showcase their research to principal investigators and DoD program sponsors at the laboratory facilities.			
FY 2019 Plans: The FY 2019 congressional increase of \$10 million supports HBCU/MI program expansion and STEM efforts for minority women.			
These funds will assist with conducting an annual competition of the HBCU/MI program for equipment/instrumentation. Increasing the number of FY 2019 summer interns and faculty research fellows from 100 to 110 participants. Collaboration with the OUSD, Office of Small Business Programs Mentor Protégé Program to enhance HBCU/MI capabilities to satisfy DoD and other contract requirements. Monitoring established Centers of Excellence in support of the USD(R&E) Science and Technology priorities in the areas of Cyber Security, Research Data Analysis, Autonomy, and the Center for STEM Scholars, needed to expand STEM opportunities for underrepresented minorities. Conducting annual review of the Centers.			
Congressional Adds Subtotals		14.135	10.000
C. Other Program Funding Summary (\$ in Millions)			
N/A			
Remarks			
D. Acquisition Strategy			
N/A			
E. Performance Metrics			
<ul style="list-style-type: none"> • Number of students funded other than undergraduates • Number of undergraduate students funded • Number of undergraduates funded who graduated • Number of students participating in the Centers of Excellence for Research and Education • Number of students working in Defense Laboratories 			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 1	R-1 Program Element (Number/Name) PE 0601228D8Z / <i>Historically Black Colleges and Universities and Minority-Serving Institutions</i>	Project (Number/Name) 448 / <i>Historically Black Colleges and Universities and Minority-Serving Institutions</i>
<ul style="list-style-type: none">• Number of undergraduates funded who graduated with degrees in STEM• Number of graduates who will continue to pursue graduate or Ph.D. degrees in STEM• Number of graduates who intend to work for DoD• Number of undergraduates who will receive scholarships and fellowships for further studies in STEM		

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity					R-1 Program Element (Number/Name)							
0400: Research, Development, Test & Evaluation, Defense-Wide / BA 2: Applied Research					PE 0602000D8Z / Joint Munitions Technology							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	19.053	19.126	19.306	-	19.306	19.589	19.930	20.303	20.733	Continuing	Continuing
000: Insensitive Munitions	-	12.867	12.942	13.069	-	13.069	13.249	13.497	13.756	14.048	Continuing	Continuing
204: Enabling Fuze Technology	-	6.186	6.184	6.237	-	6.237	6.340	6.433	6.547	6.685	Continuing	Continuing

A. Mission Description and Budget Item Justification

This program addresses applied research associated with improving the lethality, reliability, safety, and survivability of munitions and weapon systems. The goal is to develop joint enabling technologies that can be used by the Program Executive Officers (PEOs) as they develop their specific weapon programs. The program invests in research of technologies from a Joint Service perspective, thus maximizing efficiencies, ensuring the development of technologies with the broadest applicability while avoiding duplication of efforts. Increasing the lethality, range, and performance of munitions, while striving to increase the safety for our warfighters for munitions in procurement and under development guide program investments.

Munition Area Technology Groups (MATGs) and Fuze Area Technology Groups (FATGs) have been established for each munition and capability area and are tasked with: 1) coordinating, establishing, and maintaining 2023 and 2028 year technology development plans and roadmaps, 2) coordinating biannual meetings to review technical and programmatic details of each funded and proposed effort, 3) developing and submitting Technology Transition Agreements in coordination with appropriate PEOs for insertion in their Insensitive Munitions (IM) Strategic Plans / Fuze Technology Development Plan, and 4) interfacing with other MATGs / FATGs and IM / fuze science and technology projects as appropriate. The Joint Insensitive Munitions Technology Program (JIMTP) and Joint Fuze Technology Program (JFTP) will utilize a Technical Advisory Board (TAB) and Technical Advisory Committee (TAC) (consisting of senior Department of Defense (DoD) and Department of Energy (DOE) technology experts and laboratory representatives, plus senior Munitions PEO representatives), to provide program oversight, policy, direction, and priorities during its annual meeting.

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	19.111	19.170	19.361	-	19.361
Current President's Budget	19.053	19.126	19.306	-	19.306
Total Adjustments	-0.058	-0.044	-0.055	-	-0.055
• Congressional General Reductions	-	-	-	-	-
• Congressional Directed Reductions	-	-	-	-	-
• Congressional Rescissions	-	-	-	-	-
• Congressional Adds	-	-	-	-	-
• Congressional Directed Transfers	-	-	-	-	-
• Reprogrammings	-	-	-	-	-
• SBIR/STTR Transfer	-0.021	-	-	-	-
• FFRDC Reduction	-0.037	-0.044	-	-	-
• Other Program Adjustments	-	-	-0.055	-	-0.055

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
000: Insensitive Munitions	-	12.867	12.942	13.069	-	13.069	13.249	13.497	13.756	14.048	Continuing	Continuing

A. Mission Description and Budget Item Justification

The Joint Insensitive Munitions (IM) Technology Program (JIMTP) aims to develop the enabling technologies needed to build weapons in compliance with statutory requirements (United States Code, Title 10, Chapter 141, Section 2389) and regulation (DoDI 5000.1 and 5000.02, and CJCSI 3170.01F). This effort will take promising technologies developed at the laboratory scale and mature them for transition into advanced technology (Budget Activity (BA) 6.3) programs based on the priority munitions identified in the DoD IM Strategic Plans. Mature and demonstrated IM technology can be transitioned to the Program Executive Officers (PEOs), thereby decreasing the program costs and schedule risk. This will additionally promote spin-offs to other non-compliant munitions within the DoD portfolio. Without new technologies and new increased performance explosive materials and propellants, future variants of current weapon systems will have the same, or worse, response to IM stimuli. New weapon developments will face similar challenges and the US will be outgunned and outranged on the battlefield of the future. This is especially true with increased performance requirements for improved and new systems.

The JIMTP investments focus on five Munition Areas: 1) High Performance Rocket Propulsion, 2) Minimum Signature Rocket Propulsion, 3) Blast and Fragmentation Warheads, 4) Anti-Armor Warheads, and 5) Gun Propulsion. Munition Area Technology Groups (MATGs), under tri-service leadership, have developed technology roadmaps for each Munition Area that are used to guide investments based on goals consistent with the DoD IM Strategic Plans. The program is structured around these five areas with clear cross-cutting tasks.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
Title: High Performance Rocket Propulsion (HPP)	3.448	3.466	3.491
Description: HPP focuses on the development of technologies to improve the IM response 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. These technologies, when applied to rocket motors, improve to one or more threats, while not degrading the response to other IM threats and, at minimum, maintaining munition performance. Technologies include, but are not limited to, rocket propellant ingredients, including synthesis, characterization, and scale-up; reduced smoke or smoky propellants, including formulation, characterization and scale-up; rocket motor case design; materials for active and passive thermal mitigation; shock mitigation materials and techniques; passive and active coatings; active and passive venting techniques for motor cases or containers; ignition systems; sensors; and thrust mitigation techniques. Operating conditions may be controlled or widely varying in both temperature and vibration. The 2023 and 2028 year goals of the HPP MATG are concentrated on solving the IM response of missile propulsion systems due to Fragment and Bullet Impacts and Slow Cook Off for the majority of HPP rocket motors, and solving the Fast Cook Off response of very large HPP motors. Additional goal is to improve range to 2 times our current capabilities, with improvements in the IM responses.			
FY 2019 Plans:			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 2	R-1 Program Element (Number/Name) PE 0602000D8Z / <i>Joint Munitions Technology</i>	Project (Number/Name) 000 / <i>Insensitive Munitions</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>Complete thermal and aging study on propellant formulation; conduct mini-scale rocket motor testing and sub-scale fragment impact testing to determine propellant response.</p> <p>Conduct mechanical properties and test various designs for novel rocket motor case, and complete down-selection of materials.</p> <p>Conduct scaled-up testing of thermal suppression material to determine optimal placement of system within shipboard container.</p> <p>FY 2020 Plans:</p> <p>Conduct mechanical properties and test various designs for novel rocket motor case, and complete down-selection of materials.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement:</p> <p>No change.</p>			
<p>Title: Minimum Signature Rocket Propulsion (MSP)</p> <p>Description: MSP focuses on the development and demonstration of technologies to improve the IM response of MSP systems. The development and demonstration of minimum signature (MS) rocket technologies, when applied to munition systems, will improve munition IM response to one or more threats, while not degrading the response to other IM threats and, at minimum, maintaining munition performance. Technologies include, but are not limited to, MS rocket propellant formulations, ingredients for MS propellant formulations (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. Of particular interest are technologies that provide a higher burning rate minimum signature propellant with state-of-the-art energy and reduced shock sensitivity. The 2023 and 2028 year goals of the MSP MATG are concentrated on solving the IM response of missile propulsion systems due to Fragment Impact, Slow Cook Off, and Shaped Charge Jet (SCJ) threats, as well as improving range to 1.5 times our current capabilities in the near term and 2 times our current capabilities in the out years, with improvements in the IM responses.</p> <p>FY 2019 Plans:</p> <p>Scale up downslected propellant formulation from one to five gallon mixes, and conduct sub-scale rocket motor firing. Scale up 100 gram quantities to 20 pound samples, conduct mechanical properties and sensitivity testing, to downselect to best candidate material.</p> <p>Downselect modified high sensitivity formulations to six candidates to compare against baseline propellant, and conduct performance as well as fragment insult testing.</p> <p>FY 2020 Plans:</p> <p>Downselect modified high sensitivity formulations to six candidates to compare against baseline propellant, and conduct performance as well as fragment insult testing.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement:</p>		2.428	2.437
			2.462

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
Appropriation/Budget Activity 0400 / 2	R-1 Program Element (Number/Name) PE 0602000D8Z / <i>Joint Munitions Technology</i>	Project (Number/Name) 000 / <i>Insensitive Munitions</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
No change.				
Title: Blast and Fragmentation Warheads (BFW) Description: BFW focuses on the development of technologies to improve the IM response of Blast/Fragmentation munitions. These technologies, when applied to munitions, improve IM response to one or more threats, while not degrading the response to other IM threats and, at minimum, maintain munition performance. Munition operating conditions may be controlled or have widely varying environmental conditions, such as temperature and vibration, and other factors such as cost, availability and reliability may be critically important depending on the intended munition application. Technologies include, but are not limited to, new ingredient synthesis and characterization, initial formulation development, scale-up, warhead/charge configuration, venting techniques for both munitions and their containers, protection or packaging materials and systems, shock mitigation liners, initiation devices, techniques, and technologies. Applications vary but include high performance warhead fills, booster explosives, bulk demolition charges, and bulk fills for blast and/or fragmentation charges. The 2023 and 2028 year goals of the BFW MATG are concentrated on solving the IM response of blast fragment warheads to the Sympathetic Detonation, Fragment Impact, Slow Cookoff, and SCJ threats, seeking increased performance and lethality of warheads. FY 2019 Plans: Use novel energetic material to complete performance and larger scale sensitivity tests. Conduct small-scale environmental testing on explosive reformulations to downselect and pair with the optimized warhead liner. Conduct larger scale testing on selected formulations and prepare for sub-scale sympathetic reaction testing. Scale up synthesis of novel energetic, conduct hazard and testing and characterization, and small scale sensitivity testing to prepare for pilot scale-up and testing. Optimize new booster material formulations, fabricate hardware to conduct testing, and down-select to best performing material to prepare to integrated testing with new explosive material under development. FY 2020 Plans: Conduct larger scale testing on selected formulations and prepare for sub-scale sympathetic reaction testing. FY 2019 to FY 2020 Increase/Decrease Statement: Increased funding will be used for the 1000 pound general purpose bomb formulation work to improve performance and decrease sensitivity over currently available explosive fills.		2.688	2.723	2.747
Title: Anti-Armor Warheads (AAW) Description: AAW focuses on the development of explosive ingredients, explosives, and warhead and fuze technologies for improving IM of AAW munitions. The development of explosive ingredients, explosives, and warhead and fuze technologies, when applied to munitions, improve IM response to one or more threats, while not degrading the response to other IM threats		2.358	2.366	2.390

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
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 2018	FY 2019	FY 2020
<p>and, at minimum, maintain munition performance. Technologies include, but are not limited to, new ingredient synthesis and characterization, initial formulation development, scale-up, warhead/charge configuration, venting techniques for both munitions and their containers, protection/packaging materials and systems, shock mitigation liners, and initiation devices, techniques, and technologies. Applications vary but include high performance warhead fills, booster explosives, and all other technology to mitigate the violent response of AAW munitions to IM threats. Munition operating conditions may be controlled or have widely varying environmental conditions, such as temperature and vibration, and other factors such as cost, availability, and reliability may be critically important depending on the intended munition application. The 2023 and 2028 year goals of the AAW MATGs are concentrated on solving the IM response of anti-armor warheads to the Fragment Impact and Slow Cook-off, threats for larger and Medium Caliber Munitions.</p> <p>FY 2019 Plans: Work on solutions to improve the IM response of anti-armor warheads to the Fragment Impact, Sympathetic Reaction, and Shaped Charge Jet threats for larger munitions and the Fragment Impact, Slow Cook-off, and Sympathetic Reaction / Shaped Charge Jet threats for Medium Caliber Munitions. Complete design of experiments on pressed explosive formulation for multi-use material, scale-up material formulations, and start to conduct characterization studies. Down-select nano explosive composites for medium caliber ammunition, conduct pressing study, and begin scale-up production of composite material to kilogram batches. Produce precursor materials for new novel explosive material and produce 10 kg of new material, then conduct studies to ensure viability and optimize material.</p> <p>FY 2020 Plans: Produce precursor materials for new novel explosive material and produce 10 kg of new material, then conduct studies to ensure viability and optimize material.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: No change.</p>				
<p>Title: Gun Propulsion (GP)</p> <p>Description: 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 munition IM response to one or more threats, while not degrading the response to other IM threats and, at minimum, maintaining munition performance. Technologies include, but are not limited to, gun propellant formulations, ingredients for gun propellant formulations, including synthesis, characterization and scale-up, cartridge case and packaging design, active and passive venting techniques, reduced sensitivity primer propellant and primer systems, and robust primers for insensitive propellants. Applications vary, but include</p>		1.945	1.950	1.979

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense							Date: February 2019				
Appropriation/Budget Activity 0400 / 2				R-1 Program Element (Number/Name) PE 0602000D8Z / <i>Joint Munitions Technology</i>			Project (Number/Name) 000 / <i>Insensitive Munitions</i>				
B. Accomplishments/Planned Programs (\$ in Millions)							FY 2018	FY 2019	FY 2020		
<p>both large and medium caliber munitions, as well as propelling charges for mortars and shoulder launched munitions. Operating requirements vary, and other factors such as barrel life and operation over varying environmental conditions may be critically important depending on the intended munition application. The 2023 and 2028 year goals of the GP MATG are concentrated on solving the IM response of gun propulsion munitions to Fragment Impact and Slow and Fast Cook Off threats, with a focus on high performance gun propulsion systems designed for extended range and increased lethality in 2028 and 2033.</p> <p><i>FY 2019 Plans:</i> Fabricate improved cartridge cases for larger gun propulsion system, down-select prototypes after fast cookoff and fragment impact tests to complete loaded cartridges in a Budget Activity 3 project. Complete small scale cookoff and fragment testing for new large caliber propellant formulation and scale-up to 10 kilogram batches to prepare for large scale cookoff and fragment impact testing. Conduct intermediate scale fragment testing on gun propellant grains to verify results against expectations for testing new propellants in small scale samples.</p> <p><i>FY 2020 Plans:</i> Conduct intermediate scale fragment testing on gun propellant grains to verify results against expectations for testing new propellants in small scale samples.</p> <p><i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> No change.</p>											
Accomplishments/Planned Programs Subtotals							12.867	12.942	13.069		
C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• 0603000D8Z P002: BA 3 <i>Insensitive Munitions</i> Advanced Technology	19.037	19.052	19.205	-	19.205	19.480	19.801	20.208	20.637	Continuing	Continuing
Remarks											
D. Acquisition Strategy N/A											
E. Performance Metrics 1) Transition of technologies developed by the Program are tracked and documented by technology maturity.											

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 2	R-1 Program Element (Number/Name) PE 0602000D8Z / <i>Joint Munitions Technology</i>	Project (Number/Name) 000 / <i>Insensitive Munitions</i>
<p>2) Munition Area Technology Group (MATG) Technology Roadmaps are prepared, evaluated, and analyzed by Joint Insensitive Munitions Technology Program management and technical staff.</p> <p>3) Chairman's Annual Assessments for each MATG are critically reviewed by the Technical Advisory Committee to determine progress, transition plans, and relevance of each project.</p> <p>4) Project progress toward goals and milestones is assessed at each MATG meeting.</p> <p>5) Annual technical reports and papers are tracked and documented for the Program.</p> <p>6) External peer review of projects conducted as part of Joint Army/Navy/NASA/Air Force meetings.</p>		

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
204: Enabling Fuze Technology	-	6.186	6.184	6.237	-	6.237	6.340	6.433	6.547	6.685	Continuing	Continuing

A. Mission Description and Budget Item Justification

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

The Joint Fuze Technology Program (JFTP) investments are focused on capability areas that have been validated by the PEOs and Heads of the Service S&T communities. The four capability areas are:

1) Hard Target Survivable Fuzing, 2) Tailorable Effects (TE) Weapon Fuzing, 3) High Reliability Fuzing, and 4) Enabling Fuze Technologies and Common Architecture.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
Title: Hard Target Fuzing	1.549	1.552	1.562
Description: The Hard Target Fuzing challenges are grouped into three technology areas. First, improved modeling and simulation (M&S) capabilities provide the validated computational tools necessary for hard target applications. Second, basic phenomenology and understanding of the fuze environment is the science-based endeavor of providing the test equipment, instrumentation, and analysis techniques for experimentation and data gathering necessary for next generation fuzing. Third, hard target survivable fuze components are developed to increase the effectiveness of facility denial munitions by improving the prediction tools and testing methodologies to evaluate the survivability and functionality of legacy and future fuzes. Development of these technologies will enable next generation boosted and hypersonic penetrators to execute missions against hardened and deeply buried targets.			
FY 2019 Plans: Complete and release modeling and simulation tools to Service weapon designers that improve the prediction of the dynamic response of embedded fuze systems for High G shock environments. Conduct High G characterization testing for establishing design guidelines of ruggedizing fuzes in high shock environment.			
FY 2020 Plans: Conduct High G characterization testing for establishing design guidelines of ruggedizing fuzes in high shock environment.			
FY 2019 to FY 2020 Increase/Decrease Statement:			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
Appropriation/Budget Activity 0400 / 2	R-1 Program Element (Number/Name) PE 0602000D8Z / <i>Joint Munitions Technology</i>	Project (Number/Name) 204 / <i>Enabling Fuze Technology</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
No change.				
Title: Tailorable Effects Fuzing Description: Develop 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). Develop initiation and multi-point technologies; electronic safe and arm based multi-point initiators for tunable output – scalable yield warheads; MicroElectro-Mechanical Systems (MEMS) based multi-point initiators for tunable output/scalable yield warheads; and smart fuzing for tailorable effects weapons. These technologies will enable weapons that can effectively defeat a variety of targets while minimizing unintentional collateral effects. FY 2019 Plans: Demonstrate government owned detonator formulation for in-line electronic safe arm device (ESAD) used in conventional and High G weapon applications. Develop fuze critical component technologies for in-line ESADs such as high voltage switches that provide alternatives to current single point solutions. FY 2020 Plans: Develop fuze critical component technologies for in-line ESADs such as high voltage switches that provide alternatives to current single point solutions. FY 2019 to FY 2020 Increase/Decrease Statement: No change.		1.413	1.415	1.425
Title: High Reliability Fuzing Description: Develop high reliability fuzing architectures, fuzing components, and Unexploded Ordnance (UXO) reduction features. These technologies will enable the next generation of cluster munitions to achieve the required greater than 99 percent reliability goal. Evolving DoD emphasis on increased weapon system reliability is driving the need to consider new and novel approaches for achieving increased fuze reliability while maintaining or enhancing fuze design safety. DoD policy, higher weapon reliability expectations and harsher weapon system operational requirements are dictating the need for higher fuze reliability than available using current technologies. FY 2019 Plans: Complete development for miniature power source components for area effects weapons.		1.647	1.649	1.658

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense							Date: February 2019		
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 2018	FY 2019	FY 2020
<p>Demonstrate a highly reliable and robust opto-electrical fuze indicator technology to provide safety status of the munitions for weapon handlers.</p> <p>FY 2020 Plans: Demonstrate a highly reliable and robust opto-electrical fuze indicator technology to provide safety status of the munitions for weapon handlers.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Increase in FY 2019 funding will allow transition of critical fuze components technologies needed to address fuze base single point failures.</p>			
<p>Title: Enabling Fuze Technologies</p> <p>Description: Develop common/modular fuze architecture; innovative fuze component technologies; sensors; next generation fuze setting capability, tools and modeling; and fuzing power sources. These fuzing technologies will provide smaller, more cost effective solutions while meeting or exceeding the performance of existing technologies. Development of these technologies will enable future weapon applications to be more mission adaptive and smaller along with improved target detection capabilities.</p> <p>FY 2019 Plans: Develop, through additive manufacturing, conformal antennas with wideband operation to provide fuze sensor waveforms for target detection. Develop non-RF detection and advanced algorithm technologies for fuzing applications for Counter-UAS weapons.</p> <p>FY 2020 Plans: Develop non-RF detection and advanced algorithm technologies for fuzing applications for Counter-UAS weapons.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: No change.</p>	1.577	1.568	1.592
Accomplishments/Planned Programs Subtotals	6.186	6.184	6.237

C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• 0603000D8Z P301: BA 3 Enabling Fuze Advanced Technology	6.588	6.627	6.678	-	6.678	6.781	6.949	-	-	Continuing	Continuing
Remarks											

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 2	R-1 Program Element (Number/Name) PE 0602000D8Z / <i>Joint Munitions Technology</i>	Project (Number/Name) 204 / <i>Enabling Fuze Technology</i>
D. Acquisition Strategy N/A		
E. Performance Metrics <ol style="list-style-type: none"> 1) Transition of technologies developed by the Program are tracked and documented by technology maturity. 2) Fuze Area Technology Group (FATG) Technology Roadmaps are prepared, evaluated, and analyzed by Joint Fuze Technology Program management and technical staff. 3) Chairman's Annual Assessments for each FATG are critically reviewed by the Technology Assessment Group and Technology Advisory Committee to ensure the JFTP is strategic focused and strong transitions are taking place. 4) Project progress toward goals and milestones is assessed at each FATG meeting. 5) Annual technical reports and papers are tracked and documented for the Program. 6) Technology Transition Agreements in place with Munitions programs. 		

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity	R-1 Program Element (Number/Name)											
0400: <i>Research, Development, Test & Evaluation, Defense-Wide / BA 2: Applied Research</i>	PE 0602234D8Z / <i>Lincoln Laboratory</i>											
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	0.000	47.891	51.479	52.317	-	52.317	53.317	54.338	55.376	56.551	Continuing	Continuing
534: <i>Lincoln Laboratory</i>	0.000	47.891	41.265	42.101	-	42.101	43.005	43.906	44.812	45.846	Continuing	Continuing
535: <i>Technical Intelligence</i>	0.000	0.000	6.722	6.716	-	6.716	6.812	6.932	7.064	7.205	Continuing	Continuing
815: <i>Cyber Security, Science and Engineering</i>	0.000	0.000	3.492	3.500	-	3.500	3.500	3.500	3.500	3.500	Continuing	Continuing

Note

In FY 2018, \$5.253 million of the \$47.891 million is being executed under the Technical Intelligence, Project code 535.

A. Mission Description and Budget Item Justification

The Lincoln Laboratory (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 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 ten technology areas. Note: In FY 2019, the Cyber efforts moved to an individual project code 815.

Of the technology areas, there are five core-technology areas: Advanced Devices; Optical Systems and Technology; Information, Computation and Exploitation; Radio-Frequency (RF) Systems and Technology; and Cyber Security, Science and Engineering. 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 ten technology areas provide critical capabilities that support all DoD mission areas pursued at the Laboratory. The categories are selected in consultation with the Office of the Under Secretary of Defense, Research and Engineering (OUSD(R&E)), are aligned with DoD Communities of Interest (CoI), and with guidance from other DoD agencies to address technology as well as system needs. The research in these categories adapts to solve emerging DoD problems as well as longstanding problems to which new technology advances can be applied. The individual projects in each area are selected with the goal of enhancing DoD capabilities significantly, rather than incrementally.

Supporting these and other priority technology and capability areas are work efforts titled Technical Intelligence, project 535. The Technical Intelligence Program 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.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 2: Applied Research</i>	R-1 Program Element (Number/Name) PE 0602234D8Z I <i>Lincoln Laboratory</i>
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Supporting these and other priority technology and capability areas are work efforts titled Cyber Security, Science and Engineering under project code 815 starting 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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	49.748	51.596	52.467	-	52.467
Current President's Budget	47.891	51.479	52.317	-	52.317
Total Adjustments	-1.857	-0.117	-0.150	-	-0.150
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-1.761	-			
• FFRDC Adjustment	-0.096	-0.117	-	-	-
• Other Program Adjustments	-	-	-0.150	-	-0.150

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

Project: 815: *Cyber Security, Science and Engineering*

Congressional Add: *N/A*

	FY 2018	FY 2019
	0.000	-
Congressional Add Subtotals for Project: 815	0.000	-
Congressional Add Totals for all Projects	0.000	-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
534: Lincoln Laboratory	0.000	47.891	41.265	42.101	-	42.101	43.005	43.906	44.812	45.846	Continuing	Continuing

A. Mission Description and Budget Item Justification

The ten Lincoln Laboratory (LL) research areas that comprise the overall research and development portfolio are described below. Note that the Cyber efforts move to an individual project code 815 in FY 2019.

Five 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 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.
- Cyber Security Science and Engineering Program 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.

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.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense			Date: February 2019				
Appropriation/Budget Activity 0400 / 2		R-1 Program Element (Number/Name) PE 0602234D8Z / Lincoln Laboratory	Project (Number/Name) 534 / Lincoln Laboratory				
<ul style="list-style-type: none">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. <p>One system technology area:</p> <ul style="list-style-type: none">Integrated Systems technology efforts use multiple new technologies to solve important national problems. Efforts selected for funding have an applied research component focused on integrated technology capability or technologies that facilitate greater levels of integrated capability. Projects target key Department of Defense (DoD) warfare domains, including space, air, land, sea surface, and undersea.							
B. Accomplishments/Planned Programs (\$ in Millions)			FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
<p>Title: Advanced Devices</p> <p>Description: This project area targets the research and development of unique and innovative components, subsystems, and sensing concepts or methodologies that enable new solutions to important DoD problems. Activities under this technology area include specialized silicon and compound semiconductor-based devices for (Radio Frequency) RF, analog, mixed-signal, and digital electronics; photonics, optoelectronics, and laser technologies; novel devices and concepts for chemical, biological, and radiation sensing; and micro-hydraulic devices for motors and actuation.</p> <p>FY 2019 Plans: Chemical sensing technology and blue-green laser developments began in FY 2017 and will conclude in FY 2019 with the demonstration of technology prototypes. This project area expects new applied research in more flexible and higher performing optical sensors, superconducting electronics, micro-hydraulic devices, power transistors, atomic clocks, and other advanced devices.</p> <p>FY 2020 Base Plans: Efforts will include developing new devices for advanced computing and new imaging devices with greater levels of digital integration and larger formats.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: There are no notable changes between FY 2019 and FY 2020.</p>			5.200	5.005	5.032	-	5.032
<p>Title: Optical Systems and Technologies</p> <p>Description: This project area conducts applied research and develops novel concepts, technologies, and systems to be used in next-generation optical systems for the DoD. Investments in optical-based technologies can 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. Optical systems and technologies will also improve capabilities using new tactics, techniques, and procedures (TTPs) in traditional DoD mission</p>			5.344	5.600	5.379	-	5.379

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense				Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
areas such as intelligence, surveillance, and reconnaissance (ISR), space control, communications, and ballistic missile defense. FY 2019 Plans: Continue development on optical coherent combining and polarized lasers, which will enable a wide variety of applications in areas of HELs, optical imaging, multi-wavelength signal processing, and communications. Continue revolutionary work on computational design of free form optics. Develop technology for advanced spectrometers and optical communications. Begin seminal research into directed energy technologies. Continue development of advanced Lidar. FY 2020 Base Plans: Efforts will include research in photonic integrated circuits integration with microwave electronics, and new optical systems using meta-materials. FY 2019 to FY 2020 Increase/Decrease Statement: There are no notable changes between FY 2019 and FY 2020.						
Title: Radio Frequency (RF) Systems and Technologies Description: This project area focuses on research, development, and evaluation of innovative Radio Frequency (RF) technologies and system concepts for radar, signals intelligence, electronic warfare, and communications. Emerging national security challenges include a rapidly expanding threat spectrum, the increasing need to integrate sensors on platforms with severely constrained payloads, military operations in strong clutter and interference environments, detection and long duration tracking of difficult targets, and robustness against sophisticated electronic countermeasures. To address these new mission requirements, future RF systems will need to operate with increased bandwidth, higher dynamic range, higher-frequency bands, and lower size, weight and power (SWAP). FY 2019 Plans: The GaN on Si CMOS technology development will continue with improvements to advance prototypes. The fiber-combining RF array effort will develop critical enabling components. This project area expects new applied research in electronic warfare algorithms, transmit beam processing to increase RF system flexibility and performance, applications of 3D manufacturing to RF components, and other RF capability areas. Continue research on ultra-lightweight, flexible antennae arrays. Begin research into conformal antennas. Explore wideband geolocation concepts. FY 2020 Base Plans:		4.045	4.200	4.178	-	4.178

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense			Date: February 2019			
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Efforts will prioritize compact high power pulse generation and new techniques in broadband radar.						
FY 2019 to FY 2020 Increase/Decrease Statement: There are no notable changes between FY 2019 and FY 2020.						
Title: Information, Computation, and Exploitation Sciences Description: This project area achieves technical gains in data processing, computation, exploitation, and information visualization for DoD applications. The volume, velocity, and variety of information production and consumption are growing at exponential rates. Novel computing architectures, hardware and analytical techniques provide tools to process “big data”. These tools for high throughput processing, fusion, interpretation, and exploitation of “big data” are applied to both real-time and stored multi-sensor, multi-intelligence data sets. FY 2019 Plans: Continue transition of the graph processor technology to use in the Supercomputing Center with a focus on end-to-end architecture design. Continue work that focuses on providing enough information for decision making at the tactical edge through increased efficiency of available information and machine learning techniques. Continue applied research on the use of deep learning techniques for data exploitation, with an emphasis on designing algorithms that are both efficient and that can explain their decision processes to humans. New research will focus on advances in networks, computing and technologies to support operations at the tactical edge. FY 2020 Base Plans: Projects will prioritize the application of Artificial Intelligence (AI) to tactical edge decision support systems, and new technologies in explainable AI and machine learning in low-resourced domains. FY 2019 to FY 2020 Increase/Decrease Statement: There are no notable changes between FY 2019 and FY 2020.		5.533	5.860	5.676	-	5.676
Title: Biomedical Sciences and Technology Description: This project area develops advanced biomedical technology and systems to address health needs to enhance warfighter resilience and sustainability. The project area exploits expertise in advanced signal processing, optoelectronics, systems engineering and analysis, biology and chemistry, and other fields to develop novel methods and devices for interrogating and understanding physiological and cognitive aspects of the human domain. The overarching goal of these efforts is to increase human performance and prevent or predict injury through improved understanding of the biological mechanisms of disease and injury and through individualized biological monitoring, analysis, and interventions.		4.642	5.100	4.868	-	4.868

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense				Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
<p>FY 2019 Plans:</p> <p>All efforts are aligned with emergent science trends and anticipated DoD needs. Several efforts support developing a better understanding of and harnessing the brain-computer interface (BCI). Simultaneously, the Laboratory is finalizing its BCI strategy, based on its FY 2018 BCI systems analysis study. AI and machine learning play increasingly important roles in many projects. To address field forward needs, decision support tools and highly capable portable versions of sophisticated high-end laboratory-based imagers are being explored. Continue to place increasing emphasis on multimodal data collection and analysis in diverse application areas including cognitive and neuroscience, microbiome-related, and tissue healing. Continue to develop concepts and technologies in medical sensing, imaging, and diagnostics, cognitive analytics, and cellular and molecular engineering to inform multimodal approaches to understanding physiological and psychological status. Continue work on novel tool and platform development focused on accelerating and improving biotechnology research. Continue to explore medical image processing and rehabilitation tools by leveraging existing Laboratory expertise in image processing, signal analysis, and decision support algorithms.</p> <p>FY 2020 Base Plans:</p> <p>Continue development of brain-computer interface (BCI) hearing aid, and sensor platform capable of continuous real-time monitoring of health biomarkers. Develop exoskeleton hierarchical control structure, fluency metrics and individualization, and perform controls demonstration. Continue to create tools to engineer the native microbiome for controlled expression of therapeutic molecules. Continue to improve medical imaging and computational methods for tissue imaging. Continue to design and build a portable/wearable near infrared brain imaging system, and develop a quantum-enhanced diamond based magnetic imaging microscope. Begin development of capabilities to support rapid virus countermeasures.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement:</p> <p>The decrease in funding will be offset by the plan to move the future BCI effort to the Integrated Systems area.</p>						
<p>Title: Autonomous Systems</p> <p>Description: This project area addresses current and anticipated DoD mission needs in autonomous robotics. In DoD environments, unmanned systems must perform useful tasks as trusted, capable agents without continuous human operator control. These capabilities must be adapted to low-size, weight and power (SWAP) systems. Efforts include development of autonomy algorithms and technologies, such as perception and world modeling, planning, human-robot interaction, manipulation, learning and adaptation, and robotic platforms.</p> <p>FY 2019 Plans:</p>		3.764	4.100	3.978	-	3.978

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense				Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Autonomous systems are playing an increasingly important role in the DoD. A concept for autonomous undersea mapping, developed in FY 2018, will be tested in a tank, and then in an initial ocean test, in FY 2019. As swarms become more important work on algorithms, for resilience in degraded environments and risk taking by one for the good of all, are being developed. Work on human machine teaming, including algorithm and scenario development, can begin to enable robots to learn, co-adapt to their human counterparts, and share decision-making authority dynamically. Facilitate operations in uncertain, complex and dynamic environments by algorithm development for 3D semantic map construction and for autonomous task execution in simulated environments. Finally, another new effort is bringing tools from AI to complex air and missile defense scenarios to help facilitate the effective allocation and coordination of heterogeneous resources in real time against a large number of threats, with infrequent direct war fighter input. Incorporation of algorithms from the commercial world will hasten the development of autonomous systems for the DoD. Incorporation of technology improvements from the commercial world will lead to improvements in lower Size, Weight, Power and Cost (SWaP-C) systems. FY 2020 Base Plans: A majority of the FY 2019 projects will continue in FY 2020, including wide area ocean floor mapping, resilient perception for degraded environments, co-adaptive human and robotic teaming, and inter- and intra-team coordination. New efforts will focus on countering intelligent adversaries and integrating micro-robotics and micro-hydraulics for micro-Unmanned Air Vehicles (UAV). FY 2019 to FY 2020 Increase/Decrease Statement: There are no notable changes between FY 2019 and FY 2020.						
Title: Quantum System Sciences Description: This project area develops methods for sensing, communicating, and processing information using quantum mechanical manipulation not possible with classical computing techniques. Collaborations with major university quantum system science efforts are establishing a robust scientific foundation. On this foundation, application-oriented developments important for national security are being fostered. FY 2019 Plans: Research will place an emphasis on approaches to do quantum state transfer between a trapped ion and photon and leverage the ions for quantum sensing and quantum clocks. A linchpin for both quantum networks and quantum computers is the ability to manipulate robust quantum memories. Advances in quantum memories will build on the improved control and measurement techniques of FY 2018. Work on the majority of projects from FY 2018 will continue in FY 2019 and includes the following efforts. Develop 3D integration capability for superconducting transmon qubits, and demonstrate near term algorithms. Leverage initial quantum network		4.975	5.200	4.973	-	4.973

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense				Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
testbed to perform preliminary demonstrations, and develop memory capabilities and PNT and sensing applications. Leverage and improve on demonstrated ultrasensitive sensing of vector magnetic and electric fields using nitrogen-vacancy pairs in diamond, develop algorithm and integrate into deployable geometry to increase TRL for sponsor transfer. Plans also include scaling quantum computer prototypes and investigating improved control and error correction mechanisms, and the continued analysis of quantum algorithms. A new effort will develop a simulation framework to support assessing biochemistry algorithms for real applications. FY 2020 Base Plans: Continue the research agenda from FY 2019, and include extended capability in quantum communications. In addition, novel materials and devices for topologically protected qubits will be developed. FY 2019 to FY 2020 Increase/Decrease Statement: There are no notable changes between FY 2019 and FY 2020.						
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 much lower Size, Weight, and Power (SWaP) systems. FY 2019 Plans: Develop new materials and architectures with novel programmable capabilities, including shape/micro-movement and optical phase change. Develop novel material deposition/printing/manufacturing capabilities to support future DoD technology development. A new effort focuses on understanding and controlling diamond material synthesis, leveraging growth and characterization capabilities already developed under the Line, to take advantage of diamond's unique chemical and physical properties. Develop critical control capabilities over diamond synthesis and rapid critical feedback capabilities via material characterization of the synthesized diamond. Another new effort is developing the capability to grow GaN on a substrate, and then peel and transfer it, to enable low-defect III-V devices. FY 2020 Base Plans: Continue developing capability to build novel diamond-based devices to push transformative advances in a wide array of fields. Explore new applications for functional fabrics and fibers. Continue to develop advanced techniques for additive manufacturing of ceramics, metamaterials, and other new structures. FY 2019 to FY 2020 Increase/Decrease Statement:		2.960	3.100	3.161	-	3.161

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense			Date: February 2019			
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
There are no notable changes between FY 2019 and FY 2020.						
Title: Integrated Systems		2.805	3.100	4.856	-	4.856
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 2019 Plans: There are four efforts being supported. Technology development for agile low altitude (~200 kilometers) microsatellites is new, and has a focus on reducing risk for key enabling technologies including low Size, Weight, and Power (SWaP) propulsion and optical communications. Also new is the development and demonstration of a mobile diamond magnetometer, with quantum stability and solid-state vector measurement capability, to provide a jam resistant, navigation alternative for GPS-denied environments. The wafer-scale small satellite bus effort will continue to focus on system and payload design toward wafer-scale integration, and propulsion system design, fabrication, test and incorporation. The plan is to develop a highly integrated wafer-scale small satellite bus with a basic payload. The future generation Micro Air Vehicle project will continue to focus on integrating advanced sensing payloads and advanced autonomous system processing control algorithms.						
FY 2020 Base Plans: In FY 2020 a project in brain-computer interfacing (BCI) will be transitioned to the Integrated System portfolio from the Biomedical Sciences and Technology area. The other projects in the portfolio will continue their research agendas from FY 2019.						
FY 2019 to FY 2020 Increase/Decrease Statement: The increase in funding in FY 2020 will accommodate increased development costs of maturing efforts and the plan to move a brain-computer interface (BCI) effort to the Integrated Systems area.						
Title: Cyber Security, Science and Engineering		3.370	0.000	0.000	-	0.000
Description: The Cyber Security Science and Engineering Program focuses on the development of technologies and new techniques for the protection of systems against cyber-attack and exploitation. Projects 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.						
FY 2019 Plans:						

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense			Date: February 2019			
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Cyber efforts moved to an individual project code in FY 2019. FY 2020 Base Plans: Cyber efforts moved to an individual project code in FY 2019. FY 2019 to FY 2020 Increase/Decrease Statement: Cyber efforts moved to an individual project code starting in FY 2019.						
Title: Technical Intelligence 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. In FY 2018, \$5.253 million is being executed for this effort, but it is erroneously shown under project code 534. This effort is shown funded in FY 2019 and out under project code 535. FY 2019 Plans: N/A FY 2020 Base Plans: N/A FY 2020 OCO Plans: N/A FY 2019 to FY 2020 Increase/Decrease Statement: N/A		5.253	0.000	0.000	0.000	0.000
Accomplishments/Planned Programs Subtotals		47.891	41.265	42.101	0.000	42.101
C. Other Program Funding Summary (\$ in Millions) N/A						

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 2	R-1 Program Element (Number/Name) PE 0602234D8Z / <i>Lincoln Laboratory</i>	Project (Number/Name) 534 / <i>Lincoln Laboratory</i>
C. Other Program Funding Summary (\$ in Millions)		
Remarks		
D. Acquisition Strategy		
N/A		
E. Performance Metrics		
N/A		

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
535: Technical Intelligence	0.000	0.000	6.722	6.716	-	6.716	6.812	6.932	7.064	7.205	Continuing	Continuing

A. Mission Description and Budget Item Justification

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

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Technical Intelligence	0.000	6.722	6.716	0.000	6.716
Description: The Technical Intelligence Program supports strategic intelligence analysis by providing global science and technology (S&T) awareness and context in order to inform Defense technology, engineering & acquisition planning for decision-makers in an uncertain future. The program's primary objectives are to 1) Identify and contextualize emerging disruptive technologies (EDT) for senior leadership; and 2) Track global technology trends that challenge fundamental assumptions underpinning current operations and shaping the future of war. Leveraging technology watch and horizon scanning (TW/HS) tools, and scouting areas of global technology development, the program's end-state is to inform senior leadership on where best to invest resources in technology areas to maintain or regain global competitive advantage. The program complements this with tailored technical assessments that identify the military relevance, research opportunities, and policy recommendations for emerging and disruptive technologies. Note: In FY 2018, \$5.253 million is being executed for this effort, but erroneously shown under Project code 534.					
FY 2019 Plans: In FY 2019, the Technical Intelligence program will conduct efforts to achieve its primary objectives: 1) Identify and contextualize emerging disruptive technologies (EDT) for senior leadership; and 2) Track global technology					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense			Date: February 2019
Appropriation/Budget Activity 0400 / 2	R-1 Program Element (Number/Name) PE 0602234D8Z / <i>Lincoln Laboratory</i>	Project (Number/Name) 535 / <i>Technical Intelligence</i>	

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
<p>trends that challenge fundamental assumptions underpinning current operations and shaping the future of war. Specifically:</p> <ul style="list-style-type: none"> • TW/HS Tool Exploitation: Continue operationalization of the TW/HS toolkit, which includes its data analytics tool, ability to conduct two technology Horizon Scans a year, and identify, and ability to track investment data from public, private, and venture capital sources to identify where both US and foreign industries are investing resources in promising areas of capability development. • Technical Assessment Program: Sponsor multiple technical assessment activities that support the community of interest topic areas and more emphasis will be placed on conducting impact assessments of emerging technologies. These assessments will inform the S&T community on direction for future capabilities to support joint and cross domain missions. • Intel Support to S&T: Provide a bridge between the intelligence community (IC) and the S&T community to access the most relevant intelligence analysis, coordinate integration of intelligence with capability development, and conduct Red Cell assessments to inform technology investment shaping and strategic direction. An additional function will be to produce an annual S&T Intelligence Needs Plan providing the IC a formal understanding of intelligence requirements for the R&D community. • Wargaming: Integrate emerging threats from kill chain analysis and potentially disruptive technologies from horizon scanning efforts through the DoD wargaming community to better understand the potential of emerging technologies to better inform both the DoD requirements process and the technical capability development process. <p>FY 2020 Base Plans:</p> <p>In FY 2020, the Technical Intelligence program will continue to conduct efforts to achieve its primary objectives: 1) Identify and contextualize emerging disruptive technologies (EDT) for senior leadership; and 2) Track global technology trends that challenge fundamental assumptions underpinning current operations and shaping the future of war. Specifically:</p> <ul style="list-style-type: none"> • TW/HS Tool Exploitation: Continue operationalization of the TW/HS toolkit, which includes its data analytics tool, ability to conduct two technology Horizon Scans a year, and identify, and ability to track investment data from public, private, and venture capital sources to identify where both US and foreign industries are investing resources in promising areas of capability development. • Technical Assessment Program: Sponsor multiple technical assessment activities that support the community of interest topic areas and more emphasis will be placed on conducting impact assessments of emerging technologies. These assessments will inform the S&T community on direction for future capabilities to support joint and cross domain missions. 					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense				Date: February 2019		
Appropriation/Budget Activity 0400 / 2		R-1 Program Element (Number/Name) PE 0602234D8Z / <i>Lincoln Laboratory</i>		Project (Number/Name) 535 / <i>Technical Intelligence</i>		
B. Accomplishments/Planned Programs (\$ in Millions)						
		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
<ul style="list-style-type: none"> • Intel Support to S&T: Provide a bridge between the IC and the S&T community to access the most relevant intelligence analysis, coordinate integration of intelligence with capability development, and conduct Red Cell assessments to inform technology investment shaping and strategic direction. An additional function will be to produce an annual S&T Intelligence Needs Plan providing the IC a formal understanding of intelligence requirements for the R&D community. • Wargaming: Integrate emerging threats from kill chain analysis and potentially disruptive technologies from horizon scanning efforts through the DoD wargaming community to better understand the potential of emerging technologies to better inform both the DoD requirements process and the technical capability development process. <p><i>FY 2020 OCO Plans:</i> N/A</p> <p><i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> Increase resources to support technology watch and horizon scanning in order to inform the DoD R&D investments.</p>						
Accomplishments/Planned Programs Subtotals		0.000	6.722	6.716	0.000	6.716
C. Other Program Funding Summary (\$ in Millions) N/A						
Remarks						
D. Acquisition Strategy N/A						
E. Performance Metrics N/A						

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
815: Cyber Security, Science and Engineering	0.000	0.000	3.492	3.500	-	3.500	3.500	3.500	3.500	3.500	Continuing	Continuing

Note

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

A. Mission Description and Budget Item Justification

The Cyber Security Science and Engineering Program 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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Cyber Security, Science and Engineering	0.000	3.492	3.500	0.000	3.500
Description: The Cyber Security, Science and Engineering Program conducts research, development, evaluation, and deployment of prototype components and systems designed to improve the security of computer networks, hosts, and applications, thereby assuring the resilience of Department of Defense (DoD) missions against cyber-attack and exploitation. A particular focus is the overlap between the DoD mission areas and the cyber domain. Efforts include cyber analysis; creation and demonstration of robust architectures that can operate through cyber-attacks; development of prototypes that demonstrate the practicality and value of new techniques for cryptography, cyber sensing, automated threat analysis and course of action selection, anti-tamper systems, and malicious code detection; demonstrations of the impact of cyber on traditional kinetic systems; quantitative, repeatable evaluation of these prototypes; and, where appropriate, deployment of prototype technology to national- and international-level exercises and DoD and intelligence community operations.					
FY 2019 Plans: Plan to continue improving the capability to rapidly respond to evolving cyber threats and new technology trends, and guide future plans for cyber security. Further develop the design and architecture of novel cyber resilient computer systems and data management systems, as well as capabilities and tools to support mission assurance. Plan is to focus on big data analytics in support of cyber situational understanding and effective, timely decision making; these capabilities will play a key role in future applied research. Continue to develop prototype cyber decision support systems that can automatically generate effective cyber security courses of					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense				Date: February 2019	
Appropriation/Budget Activity 0400 / 2		R-1 Program Element (Number/Name) PE 0602234D8Z / <i>Lincoln Laboratory</i>		Project (Number/Name) 815 / <i>Cyber Security, Science and Engineering</i>	

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
<p>action to protect systems under attack. Start work toward developing a technology to securely patch and monitor Industrial Control Systems that control industrial processes.</p> <p><i>FY 2020 Base Plans:</i> Continue to improve the capability to rapidly respond to evolving cyber threats and new technology trends, and guide future plans for cyber security. Continue to develop “clean slate” architectural approaches to mission computing and data protection, and applications of artificial intelligence techniques to cyber security.</p> <p><i>FY 2020 OCO Plans:</i> N/A</p> <p><i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> Minimal change between FY 2019 and FY 2020.</p>					
Accomplishments/Planned Programs Subtotals	0.000	3.492	3.500	0.000	3.500

	FY 2018	FY 2019
<i>Congressional Add:</i> N/A	0.000	-
<i>FY 2018 Accomplishments:</i> N/A		
Congressional Adds Subtotals	0.000	-

C. Other Program Funding Summary (\$ in Millions)
N/A
Remarks
N/A
D. Acquisition Strategy
N/A
E. Performance Metrics
N/A

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity					R-1 Program Element (Number/Name)							
0400: Research, Development, Test & Evaluation, Defense-Wide I BA 2: Applied Research					PE 0602251D8Z I Applied Research for the Advancement of S&T Priorities							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	47.550	60.550	62.200	-	62.200	60.240	56.948	56.887	57.361	Continuing	Continuing
227: Applied Research for the Advancement of S&T Priorities	-	47.550	60.550	62.200	-	62.200	60.240	56.948	56.887	57.361	Continuing	Continuing

A. Mission Description and Budget Item Justification

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

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	49.226	60.688	53.356	-	53.356
Current President's Budget	47.550	60.550	62.200	-	62.200
Total Adjustments	-1.676	-0.138	8.844	-	8.844
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-1.581	-			
• FFRDC Reduction	-0.095	-0.138	-	-	-
• Internal Realignment for Higher Priorities	-	-	8.995	-	8.995
• Other Program Adjustments	-	-	-0.151	-	-0.151

Change Summary Explanation

The FY 2020 internal program realignment will allow the Applied Research for the Advancement of S&T Priorities (ARAP) program to complete the third and final year of the Defense Optical Channel Program (DOC-P); continue the second year of the Enhanced Energetics Effects (EEE) program; and sustain a third ARAP program to be initiated and selected in FY 2019.

Program adjustments are consistent with higher priority DoD requirements.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 2					R-1 Program Element (Number/Name) PE 0602251D8Z / <i>Applied Research for the Advancement of S&T Priorities</i>				Project (Number/Name) 227 / <i>Applied Research for the Advancement of S&T Priorities</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
227: <i>Applied Research for the Advancement of S&T Priorities</i>	-	47.550	60.550	62.200	-	62.200	60.240	56.948	56.887	57.361	Continuing	Continuing

A. Mission Description and Budget Item Justification

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

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
Title: Applied Research for the Advancement of S&T Priorities	40.169	45.003	51.883
<p>Description: The program focuses on fostering tri-service research areas of common interest within cross-cutting S&T efforts that give the joint warfighter a technological advantage. It is intended to focus on emerging areas of science, to build experience within Department of Defense laboratories, to include investment in laboratory infrastructure and people, and will be a foundation for further investments by the Services following the completion of the projects.</p> <p>Cross-cutting efforts align with the S&T Priorities, such as Electronic Warfare, Human Systems, Autonomy, and Cyber, as well other focus areas, such as Advanced Materials, Biomedical, Weapons, Quantum, and Command, Control, Communications, Computers and Intelligence.</p> <p>FY 2019 Plans: Continue concept exploration efforts that focus on the S&T priority areas. The challenge areas within the priorities include:</p> <p>Synthetic Biology for Military Environments (SBME) (\$15.003 million): Will complete three-year research project.</p> <ul style="list-style-type: none"> – Optimize chassis organisms with respect to production of synthesis products and fitness for targeted environments. – Refine tools within the open system architecture. – Increase characterization throughput of engineered circuits in both chassis organisms and cell free platforms. – Develop specialized characterization approaches. – Test additional circuits using the cell-free platform. – Refine transcriptomic, proteomic and metabolomic tools. – Select a strategy for ruggedization of the cell-free platform to improve stability for storage and field use. – Document completed circuits. 			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense			Date: February 2019		
Appropriation/Budget Activity 0400 / 2		R-1 Program Element (Number/Name) PE 0602251D8Z / <i>Applied Research for the Advancement of S&T Priorities</i>		Project (Number/Name) 227 / <i>Applied Research for the Advancement of S&T Priorities</i>	
B. Accomplishments/Planned Programs (\$ in Millions)			FY 2018	FY 2019	FY 2020
<ul style="list-style-type: none"> - Document the findings. <p>Defense Optical Channel Program (DOC-P) (\$15.000 million):</p> <ul style="list-style-type: none"> - Develop and assess adaptive laser communications protocols for tolerance to dynamic and intermittent contacts. - Begin Space-Ground laser communication scintillation characterization. - Laboratory demonstration of microwave photonics modulation of lasercom payload. - Integrate atmospheric propagation physics and optical beam control principles with quantum information theory to define capabilities, limitations, and technology requirements for Quantum Entanglement Distribution. - Integrate classical/quantum channels and prototype atomic-line spectral filter. - Begin engineering and outfitting of Startfire Optical Range optical comm facility for Quantum Key Distribution demonstration. <p>Enhanced Energetics Effects (EEE) (\$14.000 million):</p> <ul style="list-style-type: none"> - Purchase and prepare database and start defining discriminators for machine-learning of energetic material synthesis routes and propellant burn rate prediction. - Setup instrumentation and start preliminary experiments on plasma synthesis of aluminum nanoclusters encapsulated in fullerenes and aluminum-carbon core/shell structures. - Scale up nano-CL20 and amorphous-CL20 production to multiple lbs scale, then begin aluminized CL20 explosive and propellant formulations with these. - Assess concepts for additively manufacturing the XM1113 missile's energetics and case to define architectures, and start feedstock development and print head development. - Three laboratories with continuous flow processing equipment to run a Bourne Reaction (a typical test reaction) to obtain baseline materials and performance metrics. - Synthesis of ingredients and preparation of formulations of both minimum-smoke and reduced smoke rocket propellants, and burn rate characterization tests. <p>Select and initiate FY 2019 Applied Research for the Advancement of S&T Priorities project (\$1.000 million).</p> <p>FY 2020 Plans:</p> <p>Defense Optical Channel Program (DOC-P) (\$19.048 million):</p> <ul style="list-style-type: none"> - Finalize DoD relevant applications for both digital and microwave Free Space Optical. - Build Free Space Optical brass board terminals for both digital and microwave forms. - Perform outdoor range testing on new free space optical terminals. - Validate Modulated laser format for Optical Time Transfer at 2.3 km outdoor range. - Demonstrate pulsed based Optical Time Transfer. 					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
Appropriation/Budget Activity 0400 / 2	R-1 Program Element (Number/Name) PE 0602251D8Z / <i>Applied Research for the Advancement of S&T Priorities</i>	Project (Number/Name) 227 / <i>Applied Research for the Advancement of S&T Priorities</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<ul style="list-style-type: none"> - Demonstrate Multi-use and Multi-access Optical Time Transfer and communication links with frequency combs. - Validate propagation losses through free-space Quantum-communication experiments and characterize channel through quantum information metrics. <p>Enhanced Energetics Effects (EEE) (\$17.835 million):</p> <ul style="list-style-type: none"> - Machine-learning model development, for energetic material synthesis, and for propellant burn rate predictions. - In-depth characterization and reaction mechanisms studies of aluminum nanoclusters encapsulated in fullerenes and aluminum-carbon core/shell structures, and lab-scale detonation velocity measurements of these materials. - Characterization and testing of aluminized nano-CL20 and amorphous-CL20 explosive and propellant formulations to measure burn rates and detonation velocities. - Begin additive manufacturing production of chosen concept, and post-production characterization to include initiator/ignitor, propelling charge, rocket assist grain/motor, and warhead. - Three labs with continuous flow processing equipment will perform a comparative DNAN (2,4-Dinitroanisole) synthesis study, and then start scale-up studies. - A few minimum-smoke and reduced smoke rocket propellant formulation will be chosen for scale up and small-motor testing. <p>Continue FY 2019 Applied Research for the Advancement of S&T Priorities project (\$14.000 million).</p> <p>Select and initiate FY 2020 Applied Research for the Advancement of S&T Priorities project (\$1.000 million).</p> <p>Select and initiate FY 2020 Applied Research for the Advancement of S&T Priorities project (\$1.000 million).</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: The increase from FY 2019 to FY 2020 will allow the program to execute three Applied Research for the Advancement of S&T Priorities projects.</p>				
<p>Title: S&T Communities of Interest (Cols)</p> <p>Description: The S&T Cols effort facilitates cooperation and collaboration among Components; it optimizes the development of critical S&T efforts across the DoD enterprise. The efforts include the development of technology roadmaps and the integration of technology planning. The Cols select and examine critical technology areas to address gaps or opportunities.</p> <p>FY 2019 Plans: Continue to provide technical support to the Cols (\$5.131 million).</p> <p>Complete FY 2018 Seedling project: Optical Multichannel Beamforming for Electronic Warfare (\$0.750 million).</p>		7.381	7.547	10.317

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 2	R-1 Program Element (Number/Name) PE 0602251D8Z / <i>Applied Research for the Advancement of S&T Priorities</i>	Project (Number/Name) 227 / <i>Applied Research for the Advancement of S&T Priorities</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>Select a new set of Seedling projects to address gaps identified by the Cols (\$1.500 million).</p> <p>FY 2020 Plans: Continue to provide technical support to the Cols (\$6.200 million).</p> <p>Continue FY 2019 Seedling projects (\$1.500 million).</p> <p>Select a new set of Seedling projects to address gaps identified by the Cols (\$2.617 million).</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: The increase from FY 2019 to FY 2020 will support a new Seedling project.</p>			
<p>Title: Additive Manufacturing (AM) of Energetics</p> <p>Description: Additive manufacturing (AM) of energetics provides the ability for tailored and integrated munitions with enhanced capabilities. Integration of unique printed structures and printed energetics with smart fusing can allow for more agile manufacturing processes with reduced development times. As a cross-service area of interest, the Department of Defense Communities of Interest in Materials and Manufacturing Processes and Weapons Technologies have engaged in discussions to identify areas of collaboration. In order to rapidly advance additive manufacturing of energetics, a joint effort across the services and the Department of Energy would support the programs interested in AM of energetics, such as Program Executive Office for Ammunition, Next Generation Hand-Grenade, Harpoon, and Lightweight torpedo.</p> <p>FY 2019 Plans: Explore preliminary concepts of low volume direct write energetics within smart fusing in tailored AM structures. In addition, systemically explore the relationship between low volume direct write energetics and tailored AM metallic structures.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: This is a single-year investment effort for FY 2019.</p>		-	8.000
Accomplishments/Planned Programs Subtotals		47.550	60.550
C. Other Program Funding Summary (\$ in Millions)			
N/A			
Remarks			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 2	R-1 Program Element (Number/Name) PE 0602251D8Z / <i>Applied Research for the Advancement of S&T Priorities</i>	Project (Number/Name) 227 / <i>Applied Research for the Advancement of S&T Priorities</i>
D. Acquisition Strategy N/A		
E. Performance Metrics Project performance metrics specific to each effort are identified in the project plans established by the program leads and the Communities of Interest (Col). Individual project success will be monitored through these metrics.		

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 2: Applied Research</i>					R-1 Program Element (Number/Name) PE 0602668D8Z I <i>Cyber Security Research</i>							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	14.429	14.935	15.118	-	15.118	15.396	15.662	15.956	16.294	Continuing	Continuing
003: <i>Cyber Applied Research</i>	-	14.429	14.935	15.118	-	15.118	15.396	15.662	15.956	16.294	Continuing	Continuing

A. Mission Description and Budget Item Justification

The Cyber Applied Research program focuses on innovative and sustained research in both cybersecurity and computer network operations by developing new concepts to harden key network and computer components, designing new and resilient cyber infrastructures, increasing the military's ability to disrupt, fight and survive nation-state actors' cyber-attacks, measuring the state of health in cybersecurity, exploring and exploiting new ideas in cyber warfare for agile cyber operations and mission assurance, along with the ability to protect tactical networks, weapons systems and platforms.

This program is unique in that it integrates both the defensive and offensive cyber research from each of the Services to develop interoperable, defense-wide technology options to meet Combatant Command (CCMD) needs and requirements. More specifically, by increasing cross-laboratory collaboration, this program is able to take Service-specific technologies and expand their applications to the Joint Force.

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	14.775	14.969	15.162	-	15.162
Current President's Budget	14.429	14.935	15.118	-	15.118
Total Adjustments	-0.346	-0.034	-0.044	-	-0.044
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.318	-			
• FFRDC Reduction	-0.028	-0.034	-	-	-
• Other Program Adjustments	-	-	-0.044	-	-0.044

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
003: Cyber Applied Research	-	14.429	14.935	15.118	-	15.118	15.396	15.662	15.956	16.294	Continuing	Continuing

A. Mission Description and Budget Item Justification

As adversaries develop more sophisticated technology tactics, the cyber Science and Technology (S&T) community must remain agile, vigilant, and evermore creative in response. Starting in late FY 2016, the Office of Under Secretary of Defense for Research and Engineering (USD(R&E)) reviewed new cyber threats and the emerging needs of the joint operational community. As a result, a new strategic vision was developed to enhance the DoD's tactical edge in a rapidly evolving cyber domain. Beginning in FY 2018, the following new projects were initiated in the research areas (described below):

- **Behavioral Cyber Science:** Exploring the interaction between computers and human behavior by moving beyond binary electronic signals towards understanding human behavior. New insights from behavioral science will increase the effectiveness of tools, increase the effectiveness of the cyber workforce, and improve the utility of cyber solutions. Behavioral cyber science seeks to uncover details about how humans (represented by operators, users, adversaries, and/or defenders) react to cyber actions and how those reactions can be understood, from a behavioral science standpoint, and leveraged to create more effective actions and outcomes.
- **Self-Securing Systems:** Prevailing in a contested cyber environment will require new sciences and mechanisms for autonomous cybersecurity to protect the increasingly complex weapon systems and platforms that help DoD operators react more quickly to cyber-attacks. Exploring foundational research in self-securing systems will arm future DoD systems with the capability to proactively, autonomously, and seamlessly assess cyber threats. Additionally, future systems will be able to deploy self-defense mechanisms to neutralize cyber-attacks, and enable blue forces to maneuver at will. Autonomous cyber defenses will need to apply the most current advances in artificial intelligence research.
- **Precise Cyber Effects:** Precision offensive campaigns for the cyber domain require accurate and timely predictions of cyber effects to enable DoD leadership to achieve the desired outcomes from cyber operations and help manage risks associated with collateral damage. Exploring methods to derive quantifiable metrics will help improve the precision control of selecting cyber mission targets and raise the accuracy of effects; achieving an understanding of second and third order of effects will provide commanders with a higher confidence of success and limit collateral damage.
- **Applied Mathematics:** Advancing mathematical foundations that are intrinsically linked to all branches of cyber science and technology, will cut across focus areas producing new methods to design, secure, and reason about complex cyber systems. This area of research will characterize the cyber domain, maintain the integrity of data, harden systems, and analyze potential solutions.

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

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
Title: Behavioral Cyber Science	3.614	3.750	3.753

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense			Date: February 2019		
Appropriation/Budget Activity 0400 / 2		R-1 Program Element (Number/Name) PE 0602668D8Z / <i>Cyber Security Research</i>		Project (Number/Name) 003 / <i>Cyber Applied Research</i>	
B. Accomplishments/Planned Programs (\$ in Millions)			FY 2018	FY 2019	FY 2020
<p>Description: The point where hardware, software, and humans interact has formed a new area of research – Behavioral Cyber Science. Research in behavioral cyber science will advance the understanding and technical rigor of modeling and predicting human responses to cyber activities which will ultimately enhance cyber operations through planning, and training. Future research must broaden the scope beyond the impacts of cyber actions on equipment to include the impact that these cyber actions will have on human behavior and our adversary's forces. Just as an adversary's behavior may be better understood using behavioral cyber science, behavioral science can be used to improve the actions of cyber defenders and the performance of the cyber workforce. Data gleaned from observing effects of various cyber operations on users' productivity, performance, and security will help the DoD design better techniques and processes for use in cyber defense and operation.</p> <p>FY 2019 Plans: "Performance Assessment Suite for the Cyber Mission Force" project will develop an analytics platform to accommodate future sensors, interactive data-mining, and workflow monitoring plug-ins. The initial framework for platforms will be developed for U.S. Cyber Command and tested in-house using observer tablets. Research will build a better understanding of the cyber information environment by developing Cyber Mission Force (CMF) knowledge acquisition and observational assessments.</p> <p>"Designing a Contextualized Operator Perspective (COP) to Enable Joint Cyber Operations" project identifies key cyber terrain, defined as the overlap between protected mission's system needs and the supporting network, to uncover potential threats for Cyber Protection Team (CPT). The discovery supports CPT analyses for developing technical and data requirements for preliminary work support systems. The research measures and explores aspects of situational awareness (SA) theory to determine the applicable methodologies to evaluate work support system designs.</p> <p>FY 2020 Plans: The Performance Assessment Suite project will develop a prototype of workflow monitoring, addressing human-in-the-loop protocols, by refining its design through simulation-based software. The research will document results from laboratory and capstone experiments at U.S. Cyber Command's Cyber Immersion Laboratory.</p> <p>Designing COP will analyze explainable artificial intelligence (XAI) to enhance the capabilities of the work support system. XAI will create a suite of machine learning techniques, enabling human users to understand, trust, and manage the emerging generation of artificially intelligent applications. Developing XAI will provide researchers with extensive search, gathering, reviewing, and assimilating capabilities.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Additional resources will be used to complete development phase of projects under the Behavioral Cyber Science thrust.</p>					
Title: Self-Securing Systems			5.615	5.822	5.925

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense			Date: February 2019		
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 2018	FY 2019	FY 2020
<p>Description: The pervasive nature of software-reliant systems in today's modern military creates new opportunities for sophisticated adversaries. The vast majority of DoD weapons systems, platforms, and networks rely on software to operate. Software can often be disrupted remotely, which necessitates a new kind of security to protect against such cyber-attacks. Defending the software and network-based aspects of critical weapon systems is challenging for a number of reasons, chief among which is the advanced nature of the adversary in the cyber realm. Future cyber adversaries will be well-funded, well-informed, and agile. Building weapon systems, platforms, and networks that defend themselves in real time will be vital in protecting ourselves against this adversary. The Department needs systems that can autonomously monitor and manage their own health and security posture through advanced sensing and perception, reasoning, and planning. Such systems identify and classify threats much more quickly than a human operator, and therefore, neutralize the threat more quickly and effectively. However, researchers must be cognizant of the potential unintended consequences of turning security over to autonomous systems. Verification techniques must be developed to ensure that autonomous and dynamic system changes maintain correct mission-focused capabilities without introducing unintended vulnerabilities. Conversely, developing techniques to track and audit actions taken by autonomous systems ensures that direct control can be reasserted.</p> <p>FY 2019 Plans:</p> <p>"Robust Low-Level Cyber Attack-resilience for Military Defense (ROLL CAGE)" will develop fast and lightweight autonomous advanced intrusion detection systems (IDS) to immediately sense anomalous behavior. Research will develop and incorporate aspects of moving target defense (MTD) and deception techniques into the IDS, based on the identification of threats. The IDS will have the ability to respond proactively to adversary actions and to detect and mitigate cyber threats. Research will explore the threat taxonomy and fine-tune development of monitoring agents under various platforms. ROLL CAGE will demonstrate system specific vulnerabilities and protection against cyber-attacks using modularized agents. These agents will establish systems operation baselines, conduct real-time monitoring, identify abnormalities, and alert users/operators of potential cyber threats and vulnerabilities.</p> <p>"Autonomous Intelligent Resilient Systems (AIRS)" will develop a reference architecture for command and control (C2) / Internet of Battlefield Things (IoBT) software-defined networks. The architecture allows researchers to harness the predicative analytics of intelligent command and control and battlefield services. The framework will include network topology of data and the control plane model.</p> <p>"Self-Securing Systems: Autonomous Cyber Defense" project will develop an autonomous cyber deception system prototype. The research will design hybrid games and hyper-games for cyber deception used to investigate an AI technique called Reinforcement Learning. In addition research will develop adversary simulator (in future years to be refined by computer network operations operator survey results).</p> <p>FY 2020 Plans:</p>					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense			Date: February 2019		
Appropriation/Budget Activity 0400 / 2		R-1 Program Element (Number/Name) PE 0602668D8Z / <i>Cyber Security Research</i>		Project (Number/Name) 003 / <i>Cyber Applied Research</i>	
B. Accomplishments/Planned Programs (\$ in Millions)			FY 2018	FY 2019	FY 2020
<p>ROLL CAGE will develop MTD and deception defense techniques based on game theoretic modeling to reflect realistic interactions of attackers and defenders. The research considers attack scenarios / patterns developed by an ally's Artificial Intelligence / Machine Learning (AI/ML) based intrusion detection simulator and tests the technologies using new attack patterns. The project will host a final demonstration.</p> <p>AIRS refines the reference architecture, ensuring that the system is able to understand and represent machine understandable languages. AIRS requires a high level understanding of machine understandable languages to make accurate system diagnoses. To ensure that the system has situational awareness, researchers will develop a representative simulation test environment with the requisite instrumentation to evaluate AIRS.</p> <p>Self-Securing Systems project will demonstrate a prototype of autonomous cyber defense using deception techniques based on human operator defender goals. The demonstration will test and simulate different AI techniques, using both deception and cyber defense tactics.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Additional resources will be used to complete development phase of projects under the Self-Securing Systems thrust.</p>					
<p>Title: Precise Cyber Effects</p> <p>Description: When compared to traditional methods of kinetic warfare, cyber conflicts are still relatively new and untested. Cyber operators often have incomplete information about their targets prior to completing an action. This deficit makes it difficult to predict the precise outcomes or collateral damage caused by a cyber operation. With this uncertainty, military leaders may act with an undue sense of caution in using cyber capabilities. Improving technology and techniques for quantifying cyber effects will increase the effectiveness of cost estimation, enhance consequence prediction and ensure precision. Highly precise and predictable cyber effects can also achieve mission goals despite the presence of both incomplete and maliciously-created false information.</p> <p>FY 2019 Plans: Identify and fund cyber seedling project(s) with potential impacts (intended and unintended) of employing cyber effects while limiting collateral damage.</p> <p>US-Australian bilateral Mission Assurance Research Collaboration (MARC) project arrangement will analyze data collected during TALISMAN SABRE (TS) 2017 command post exercise by applying mission mapping algorithms and machine learning processes. The algorithms, including identifying workflows, will characterize computing resources, and resolve individuals' identities across multiple modes of communication. The team will develop plans for strategic science and technology (S&T) inject into Pacific</p>			3.235	3.340	3.387

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 2	R-1 Program Element (Number/Name) PE 0602668D8Z / <i>Cyber Security Research</i>	Project (Number/Name) 003 / <i>Cyber Applied Research</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
Sentry 2019 exercise. Researchers will identify use cases for validating dynamic mission mapping algorithms and processes through instrumentation of the field training exercise and command post exercise.			
FY 2020 Plans: MARC will curate and index data collected during the S&T inject of Pacific Sentry 2019 exercise.			
FY 2019 to FY 2020 Increase/Decrease Statement: Additional resources will be needed to further develop methods and tools for autonomous cyber operations.			
Title: Applied Mathematics for Cyber		1.965	2.023
Description: Mathematics is intrinsically linked to all branches of science and technology, including cyber security research. 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. This area of research is needed to help characterize the cyber domain and cyber security, maintain the integrity of data, harden systems, and analyze potential solutions. Continued research in mathematical theory is crucial to maintain and increase the security of cyber systems. The goal of this effort is to provide the tools and techniques to improve the design and operation of cyber systems.			2.053
FY 2019 Plans: "Stealthy Communications and Situational Awareness" project will initiate the integration of Linear Statistical Network Analysis (LSNA) matrix with the Naval Research Laboratory's Extensible Stealthy Protocol (NExtSteP) testbed to identify and classify channel embedding methods. In addition, research will also initiate production of high fidelity traffic using the NExtSteP testbed to analyze the types of channels that appear in candidate carrier protocols.			
"Mitigating Adversarial Machine Learning" (MAML) project will develop a prototype that simulates a framework for two- and three-model ensembles. The research composes models into ensembles to test for potential weaknesses and exploits within the overall system.			
FY 2020 Plans: The Stealthy project will continue to develop the LSNA infused NExtSteP testbed and determine whether metrics for "stealthiness" and throughput are consistent with the proof-of-concept overlay protocol.			
Research under the MAML project will investigate at least two evasion, inversion, and/or extraction attacks in a laboratory environment. The results will inform research on both ML model resilience and its effects on decision support and human operators.			
FY 2019 to FY 2020 Increase/Decrease Statement:			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 2	R-1 Program Element (Number/Name) PE 0602668D8Z / <i>Cyber Security Research</i>	Project (Number/Name) 003 / <i>Cyber Applied Research</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
Additional resources are needed to complete the development phase of projects under the thrust.			
Accomplishments/Planned Programs Subtotals		14.429	15.118
C. Other Program Funding Summary (\$ in Millions)			
N/A			
Remarks			
D. Acquisition Strategy			
N/A			
E. Performance Metrics			
<ul style="list-style-type: none"> – Number of publications in refereed journals and peer reviewed reports or conference proceedings; – Number of external research collaborations and interactions with the broader cyber community; – Transition of tools, techniques and methodologies for use in DoD, Federal or commercial entities; – Improved technology readiness levels; and – Affordability. 			

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	8.614	9.279	9.580	-	9.580	9.662	9.760	9.811	10.019	Continuing	Continuing
278: Software Engineering Institute (SEI) Applied Research	-	8.614	8.279	8.580	-	8.580	8.662	8.760	8.811	9.019	Continuing	Continuing
817: Cyber Security, Applied Research	-	0.000	1.000	1.000	-	1.000	1.000	1.000	1.000	1.000	Continuing	Continuing

A. Mission Description and Budget Item Justification

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

Software is critical to meeting the Department of Defense's (DoD) increasing demand for national defense systems that are high-quality, affordable, and deployed in a timely way. With growing global parity in software engineering, the DoD must maintain leadership in all aspects of software-based system development, operation, defense, and evolution to avoid strategic surprise. To assist the DoD in retaining a long-term differential advantage over potential adversaries, the Software Engineering Institute (SEI) Applied Research program element (PE) develops and evaluates the feasibility and practicality of software and computer science concepts, with the potential to improve future DoD systems. The research conducted by this PE directly benefits the technical domains such as Command, Control, Communications, Computers, and Intelligence (C4I), Autonomous Systems and Artificial Intelligence (AI), Cyber, and Engineered Resilient Systems.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 2: Applied Research</i>	R-1 Program Element (Number/Name) PE 0602751D8Z I <i>Software Engineering Institute (SEI) Applied Research</i>
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B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	8.955	9.300	9.608	-	9.608
Current President's Budget	8.614	9.279	9.580	-	9.580
Total Adjustments	-0.341	-0.021	-0.028	-	-0.028
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.324	-			
• FFRDC Reduction	-0.017	-0.021	-	-	-
• Other Program Adjustments	-	-	-0.028	-	-0.028

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
278: Software Engineering Institute (SEI) Applied Research	-	8.614	8.279	8.580	-	8.580	8.662	8.760	8.811	9.019	Continuing	Continuing
A. Mission Description and Budget Item Justification												
Work conducted under this PE will enable resilient mission assurance in heterogeneous and contested environments through the verification and validation of system performance and architecture. The program will also assist the DoD in retaining a long-term advantage in the areas of software-intensive systems and cyber security by enhancing assurance, exploiting automation and AI, and understanding human-computer interaction.												
The SEI Applied Research PE has two main research thrusts with known military applications: (1) Software Engineering, Systems Verification and Validation, and Mission Assurance (formerly Mission Assurance); and (2) Information Assurance.												
B. Accomplishments/Planned Programs (\$ in Millions)									FY 2018	FY 2019	FY 2020	
Title: SEI Applied Research in the Area of Software Engineering, Systems Verification and Validation, and Mission Assurance (formerly Mission Assurance)									6.811	6.002	6.006	
Description: Increasingly numerous lines of code 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 system in untested environments.												
FY 2019 Plans:												
• Create and build benchmarks and datasets, using emerging machine learning computing technologies, for evaluating and improving the effectiveness of machine learning (ML) and computing resource optimization for DoD Systems.												
• Design and train machine learning algorithms to maximize human-machine teaming effectiveness.												
• Develop causal modeling tools for system software cost to identify causal factors for software cost that will provide a basis for controlling program costs.												
FY 2020 Plans:												
• Create tools to automatically assure untrusted external software components to enable rapid software composition for DoD systems.												

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense								Date: February 2019			
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 2018	FY 2019	FY 2020	
• Devise techniques to automatically recover the deployment baseline (artifacts, design rules, security) for cloud-based infrastructure to enable true Infrastructure as Code.											
FY 2019 to FY 2020 Increase/Decrease Statement: FY2019 adjustments are reflective of high priority DoD requirements.											
Title: SEI Applied Research in the areas of Information Assurance (IA)								1.803	2.277	2.574	
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 uses software developed from an unknown supply chain 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 2019 Plans: • Develop advanced analytics and machine learning technologies to enable self-adaptive cyber defenses. • Develop and test tools that provide rapid certifiable trust for autonomous, cyber-physical platforms.											
FY 2020 Plans: • Develop predictive models to find security vulnerabilities introduced through architectural flaws. • Devise practical formal methods which can be utilized to produce trustworthy and assured software on more complex systems; and the emerging technologies of interest to the DoD.											
FY 2019 to FY 2020 Increase/Decrease Statement: The increase in budget from FY 2019 to FY 2020 reflects additional resources required for technology maturation efforts.											
Accomplishments/Planned Programs Subtotals								8.614	8.279	8.580	
C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• BA 3, PE# 0603781D8Z: Software Engineering Institute (SEI)	14.468	15.016	15.111	-	15.111	15.239	15.400	15.688	16.020	Continuing	Continuing

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense			Date: February 2019
Appropriation/Budget Activity 0400 / 2	R-1 Program Element (Number/Name) PE 0602751D8Z / <i>Software Engineering Institute (SEI) Applied Research</i>	Project (Number/Name) 278 / <i>Software Engineering Institute (SEI) Applied Research</i>	

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

<u>Line Item</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020</u> <u>Base</u>	<u>FY 2020</u> <u>OCO</u>	<u>FY 2020</u> <u>Total</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
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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

E. Performance Metrics

Performance metrics for this project include the transition of solutions, methods, and practices for use in DoD technology development programs and programs of record; the transition of solutions, methods, and practices to the Defense Industrial Base to support DoD technology development programs and programs of record, the number of citations in peer reviewed journals and reports, and the number of external research collaborations and interactions with the broader software and computer science community.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
817: Cyber Security, Applied Research	-	0.000	1.000	1.000	-	1.000	1.000	1.000	1.000	1.000	Continuing	Continuing
A. Mission Description and Budget Item Justification												
Work conducted under this project will enable resilient mission assurance in heterogeneous and contested environments through the verification and validation of system performance and architecture. The program will also assist the DoD in retaining a long-term advantage in the area of cybersecurity by enhancing assurance, exploiting automation, and understanding human-computer interaction.												
B. Accomplishments/Planned Programs (\$ in Millions)									FY 2018	FY 2019	FY 2020	
Title: Cyber Security									-	1.000	1.000	
Description: Warfighting in the cyber domain often operates at sub-second timescales and across multiple domains of authority. Methods used to accomplish many tasks (e.g., malware analysis, coordinating multiple agents) demand large amounts of time, attention, and special skills and are not scalable. This thrust seeks to develop and increase the use of automation to simplify the completion of these tasks. Example activities include automation of moving target defenses, code artifact reverse engineering, analysis of network flows at enterprise scale, assessing the operating boundaries for Artificial Intelligence (AI) and Machine Learning (ML) algorithms, and development and assessment of workforce skills.												
FY 2019 Plans:												
• Utilize AI/ML techniques to find and classify security vulnerabilities in code, including predicting security flaws in synthetic code.												
• Develop a reference architecture that automatically adapts to organizations’ tooling and codebases to accurately classify and prioritize security alerts, minimizing manual effort by validators.												
FY 2020 Plans:												
• Develop means to assure and verify trustworthiness of AI/ML systems via new techniques to continuously assess the operating boundaries for AI/ML algorithms.												
FY 2019 to FY 2020 Increase/Decrease Statement:												
There is no change in the Cyber investment between FY 2019 and FY 2020. Note: the Cyber effort was funded in PE 0603781D8Z, Project 781 in FY 2018.												
Accomplishments/Planned Programs Subtotals									-	1.000	1.000	
C. Other Program Funding Summary (\$ in Millions)												
N/A												

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 2	R-1 Program Element (Number/Name) PE 0602751D8Z / <i>Software Engineering Institute (SEI) Applied Research</i>	Project (Number/Name) 817 / <i>Cyber Security, Applied Research</i>
C. Other Program Funding Summary (\$ in Millions) Remarks D. Acquisition Strategy N/A E. Performance Metrics Metrics for this program include transition of tools, methods, and practices for use in DoD technology development programs and programs of record; transition of tools, methods, and practices to the Defense Industrial Base to support DoD technology development programs and programs of record; the number of citations in peer reviewed journals and reports; and the number of external research collaborations and interactions with the broader software and computer science community.		

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 3: Advanced Technology Development (ATD)</i>					R-1 Program Element (Number/Name) PE 0603000D8Z <i>I Joint Munitions Advanced Technology</i>							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	25.550	25.540	25.779	-	25.779	26.156	26.610	27.109	27.685	Continuing	Continuing
002: <i>Insensitive Munitions Advanced Technology</i>	-	18.977	19.009	19.205	-	19.205	19.480	19.801	20.208	20.637	Continuing	Continuing
301: <i>Enabling Fuze Advanced Technology</i>	-	6.573	6.531	6.574	-	6.574	6.676	6.809	6.901	7.048	Continuing	Continuing

A. Mission Description and Budget Item Justification

This program addresses advanced technology development associated with improving the lethality, range, reliability, safety, and survivability of munitions and weapon systems. The mission seeks to build a more lethal force through technology advancements geared towards performance and readiness. The goal is to develop and demonstrate joint enabling technologies that can be used by the Program Executive Offices (PEO) as they develop their specific weapon programs. The program invests in and demonstrates technologies from a Joint Service perspective, thus maximizing efficiencies, ensuring the development of technologies with the broadest applicability while avoiding duplication of efforts. Increasing the lethality, range, and performance of munitions, while striving to increase the safety for our warfighters for munitions in procurement and under development guide program investments.

Munition Area Technology Groups (MATGs) and Fuze Area Technology Groups (FATGs) have been established for each munition and capability area and are tasked with: 1) coordinating, establishing, and maintaining 2018 and 2023 year technology development plans and roadmaps, 2) coordinating biannual meetings to review technical and programmatic details of each funded and proposed effort, 3) developing and submitting Technology Transition Agreements in coordination with appropriate PEO for insertion in their Insensitive Munition (IM) Strategic Plans / Fuze Technology Development Plan, and 4) interfacing with other MATGs / FATGs and IM / fuze science and technology projects as appropriate. The Joint Insensitive Munitions Technical Program (JIMTP) and Joint Fuze Technical Program (JFTP) will utilize a Technical Advisory Board (TAB) and Technical Advisory Committee (TAC) (consisting of senior Department of Defense (DoD) and Department of Energy (DOE) technology experts and laboratory representatives plus senior Munitions PEO representatives) to provide program oversight, policy, direction, and priorities during its annual meeting.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603000D8Z I <i>Joint Munitions Advanced Technology</i>
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B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	25.627	25.598	25.853	-	25.853
Current President's Budget	25.550	25.540	25.779	-	25.779
Total Adjustments	-0.077	-0.058	-0.074	-	-0.074
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.028	-			
• FFRDC Reduction	-0.049	-0.058	-	-	-
• Other Program Adjustments	-	-	-0.074	-	-0.074

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity					R-1 Program Element (Number/Name)				Project (Number/Name)			
0400 / 3					PE 0603000D8Z / Joint Munitions Advanced Technology				002 / Insensitive Munitions Advanced Technology			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
002: Insensitive Munitions Advanced Technology	-	18.977	19.009	19.205	-	19.205	19.480	19.801	20.208	20.637	Continuing	Continuing

A. Mission Description and Budget Item Justification

The Insensitive Munitions (IM) effort addresses advanced technology development associated with improving the lethality, reliability, safety, and survivability of munitions and weapon systems. The goal is to develop and demonstrate joint enabling technologies that can be used by program managers as they develop their specific weapon programs. The program invests in and demonstrates technologies from a Joint Service perspective, thus ensuring the development of technology with the broadest applicability while avoiding duplication of efforts – providing efficiencies and cost savings for the Department.

This effort will demonstrate enabling technologies needed to develop weapons in compliance with IM requirements established in United States Code, Title 10, Chapter 141, Section 2389 and DoD Instruction 5000.1 and 5000.02. This effort will take promising technologies demonstrated at the laboratory scale and transition them into demonstration programs utilizing generic hardware based on priority munitions identified in the Program Executive Office (PEO) IM Strategic Plans. Mature demonstrated IM technology can be transitioned, thereby decreasing their program costs and schedule risk and facilitating spin-offs to other non-compliant munitions within their portfolios. Technologies demonstrated seek to improve the performance, lethality, and range of weapons to ensure the U.S. is not outgunned and outranged on the battlefield of the future.

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

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
Title: High Performance Rocket Propulsion (HPP)	3.741	3.761	3.792
Description: HPP focus on the development and demonstration of technologies to improve the IM response 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. These technologies, when applied to rocket motors, improve IM response to one or more threats, while not degrading the response to other IM threats and, at minimum, maintaining munition performance. Technologies include, but are not limited to, rocket propellant ingredients, including synthesis, characterization and scale-up; reduced smoke or smoky propellants, including formulation, characterization and scale-up; rocket motor case design; materials for active and passive thermal mitigation; shock mitigation materials and techniques; passive and active coatings; active and passive venting techniques for motor cases or containers; ignition systems; sensors; and thrust mitigation techniques. Operating conditions may be controlled			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
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 2018	FY 2019	FY 2020
or widely varying in both temperature and vibration. The 2023 and 2028 year goals of the HPP MATG are concentrated on solving the IM response of missile propulsions systems due to Fragment and Bullet Impacts and Slow Cook Off for the majority of High Performance Propulsion rocket motors, and solving the Fast Cook Off response of very large High Performance Propulsion motors. Additional goal is to improve range to 2 times our current capabilities, with improvements in the IM responses. FY 2019 Plans: Design and ballistic testing of a HD 1.3 propellant in a new DACS for Missile Defense Agency. Demonstrate venting solution for large rocket motor casing applicable to sidewinder and AMRAAM. Demonstrate SCO/FCO improvement and firing of MK-135 Tomahawk boost motor. FY 2020 Plans: Design and ballistic testing of a HD 1.3 propellant in a new DACS for Missile Defense Agency. Demonstrate BI/FI improvement and firing of MK-135 Tomahawk boost motor. FY 2019 to FY 2020 Increase/Decrease Statement: No change.				
Title: Minimum Signature Rocket Propulsion (MSP) Description: MSP focuses on the development and demonstration of technologies to improve the IM response of MSP systems. The development and demonstration of minimum signature (MS) rocket technologies, when applied to munition systems, will improve munition IM response to one or more threats, while not degrading the response to other IM threats and, at minimum, maintaining munition performance. Technologies include, but are not limited to, MS rocket propellant formulations; ingredients for MS propellant formulations, 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. Of particular interest are technologies toward higher burning rate MS propellants with state-of-the-art energy and reduced shock sensitivity. The 2023 and 2028 year goals of the MSP MATG are concentrated on solving the IM response of missile propulsion systems due to Fragment Impact, Slow Cook Off, and Shaped Charge Jet (SCJ) threats, as well as improving range to 1.5 times our current capabilities in the near term and 2 times our current capabilities in the out years, with improvements in the IM responses. FY 2019 Plans: Manufacture components and propellant, for assembly and prep for testing an extruded propellant to improve Fragment Impact response of TOW flight motor. Complete hardware design and manufacture for small diameter rocket motor. FY 2020 Plans: Conduct testing of extruded propellant to improve Fragment Impact response of TOW flight motor.		2.421	2.431	2.462

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
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 2018	FY 2019	FY 2020
Conduct slow cookoff testing on small diameter rocket motor to demonstrate improved reaction response.				
FY 2019 to FY 2020 Increase/Decrease Statement: No change.				
Title: Blast and Fragmentation Warheads (BFW) Description: BFW focus on the development and demonstration of technologies to improve the IM response of BFW munitions. The development and demonstration of explosive ingredients, explosives, and warhead and fuze technologies, when applied to munitions, improve IM response to one or more threats, while not degrading the response to other IM threats and, at minimum, maintaining munition performance. Technologies include, but are not limited to, new ingredient synthesis and characterization, initial formulation development, scale-up, warhead/charge configuration, venting techniques for both munitions and their containers, protection / packaging materials and systems, shock mitigation liners, initiation devices, techniques, and technologies. Applications vary but include high performance warhead fills, booster explosives, bulk demolition charges, and bulk fills for blast and/or fragmentation charges. Munition operating conditions may be controlled or have widely varying environmental conditions, such as temperature and vibration, and other factors such as cost, availability, and reliability may be critically important depending on the intended munition application. The 2023 and 2028 year goals of the BFW MATG are concentrated on solving the IM response of blast fragment warheads to the Sympathetic Detonation, Fragment Impact, Slow Cookoff, and SCJ threats, seeking increased performance and lethality of warheads. FY 2019 Plans: Manufacture and assemble large diameter indirect fire munitions to prepare to demonstrate improved Fragment Impact, Slow Cookoff, and Sympathetic Reaction response with lethality enhancement using novel warhead design and venting technologies. Down-selection of explosive material and manufacture of warheads to conduct water pit testing on novel warhead design for direct fire ammunition warhead. FY 2020 Plans: Conduct IM testing on large diameter indirect fire munitions to demonstrate improved Fragment Impact, Slow Cookoff, and Sympathetic Reaction response. Conduct water pit testing and conduct lethality assessment on novel warhead design for direct fire ammunition warhead. FY 2019 to FY 2020 Increase/Decrease Statement: No change.		7.548	7.452	7.502
Title: Anti-Armor Warheads (AAW) Description: AAW focuses on the development and demonstration of explosive ingredients, explosives, and warhead and fuze technologies for improving Insensitive Munitions (IM) of AAW munitions. The development of explosive ingredients,		3.506	3.604	3.644

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603000D8Z / <i>Joint Munitions Advanced Technology</i>	Project (Number/Name) 002 / <i>Insensitive Munitions Advanced Technology</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>explosives, and warhead and fuze technologies, when applied to munitions, improve IM response to one or more threats, while not degrading the response to other IM threats and, at minimum, maintaining munition performance. Technologies include, but are not limited to, new ingredient synthesis and characterization, initial formulation development, scale-up, warhead/charge configuration, venting techniques for both munitions and their containers, protection/packaging materials and systems, shock mitigation liners, and initiation devices, techniques, and technologies. Applications vary, but include high performance warhead fills, booster explosives, and all other technology to mitigate the violent response of AAW munitions to IM threats. Munition operating conditions may be controlled or have widely varying environmental conditions, such as temperature and vibration, and other factors such as cost, availability, and reliability may be critically important depending on the intended munition application. The 2023 and 2028 year goals of the AAW MATGs are concentrated on solving the IM response of anti-armor warheads to the Fragment Impact and Slow Cook-off, threats for larger and Medium Caliber Munitions.</p> <p>FY 2019 Plans: Demonstrate full IM improvement to 40mm sub-munition for 155mm carrier rounds with DPICM capability. Demonstrate improved SCO response of medium caliber munitions using SMA technology. Demonstrate improved safety of underwater neutralizing charges using novel energetics.</p> <p>FY 2020 Plans: Demonstrate full IM improvement to 40mm sub-munition for 155mm carrier rounds with DPICM capability.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Increased funding will be used to accelerate the Dual-Purpose Improved Conventional Munition (DPICM) replacement cannon round capability project to demonstrate a 99% reliability for an insensitive munitions compliant the system.</p>			
<p>Title: Gun Propulsion (GP)</p> <p>Description: 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 munition Insensitive Munitions (IM) response to one or more threats, while not degrading the response to other IM threats and, at minimum, maintaining munition performance. Technologies include, but are not limited to, gun propellant formulations, ingredients for gun propellant formulations (including synthesis, characterization and scale-up), cartridge case and packaging design, active and passive venting techniques, reduced sensitivity primer propellant and primer systems, and robust primers for insensitive propellants. Applications vary, but include both large and medium caliber munitions, as well as propelling charges for mortars and shoulder launched munitions. Operating requirements vary, and other factors such as barrel life and operation over varying environmental conditions may be critically important depending on the intended munition application. The 2023 and 2028 year goals of the GP MATG are concentrated on solving the IM response of gun propulsion munitions to Fragment Impact and Slow and Fast Cook threats, with a focus on high performance gun propulsion systems designed for extended range and increased lethality in 2028 and 2033.</p>		1.761	1.761
			1.805

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020
FY 2019 Plans: Demonstrate weight and cook off improvement for medium caliber propulsion systems. Demonstrate improved FI and SCO venting and packaging for 120mm tank rounds. FY 2020 Plans: Demonstrate weight and cook off improvement for medium caliber propulsion systems. FY 2019 to FY 2020 Increase/Decrease Statement: No change.												
Accomplishments/Planned Programs Subtotals										18.977	19.009	19.205
C. Other Program Funding Summary (\$ in Millions)												
Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost	
• 0602000D8Z P000: BA2 Insensitive Munitions	12.910	13.037	13.178	-	13.178	13.362	13.618	13.889	-	Continuing	Continuing	
Remarks												
D. Acquisition Strategy N/A												
E. Performance Metrics												
1) Transition of technologies developed by the program are tracked and documented by technology maturity. 2) MATG Technology Roadmaps are prepared, evaluated, and analyzed by JIMTP management and technical staff. 3) Chairman's Annual Assessments for each MATG are critically reviewed by the Technical Advisory Committee (TAC) to determine progress, transition plans, and relevance of each project. 4) Project progress toward goals and milestones is assessed at each MATG meeting. 5) Annual technical reports and papers are tracked and documented for the Program. 6) External Peer Reviews of Projects are conducted as part of Joint Army/Navy/NASA/Air Force meetings. 7) Technology Transition Agreements are in place with Munition programs.												

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
301: Enabling Fuze Advanced Technology	-	6.573	6.531	6.574	-	6.574	6.676	6.809	6.901	7.048	Continuing	Continuing

A. Mission Description and Budget Item Justification

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

Under the Joint Fuze Technology Program (JFTP), investments are focused on specific capability areas that have been identified by department strategic guidance and current shortfalls in weapon systems and validated by the PEOs and Heads of the Service S&T communities. These four capability areas are: 1) Hard Target Survivable Fuzing, 2) Tailorable Effects (TE) Weapon Fuzing, 3) High Reliability Fuzing, and 4) Enabling Fuze Technologies and Common Architecture.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
Title: Hard Target Fuzing	1.406	1.417	1.424
Description: The Hard Target Fuzing challenges are grouped into three Technology Areas. First, improved modeling and simulation capabilities provide the validated computational tools necessary for hard target applications. Second, basic phenomenology and understanding of the Fuze Environment is the science-based endeavor of providing the test equipment, instrumentation, and analysis techniques for experimentation and data gathering necessary for next generation fuzing. Third, hard target survivable fuze components are developed to increase the effectiveness of facility denial munitions by improving the prediction tools and testing methodologies to evaluate the survivability and functionality of legacy and future fuzes. Development of these technologies will enable next generation boosted and hypersonic penetrators to execute missions against hardened and deeply buried targets.			
FY 2019 Plans: Develop fully programmable miniature data recorders for embedded fuzing that can survive extreme hard target fuzing environments.			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
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 2018	FY 2019	FY 2020
Develop and demonstrate methods to accurately replicate high G loading on fuzing components and transition to the DoD and Industry fuze community. FY 2020 Plans: Develop and demonstrate methods to accurately replicate high G loading on fuzing components and transition to the DoD and Industry fuze community. FY 2019 to FY 2020 Increase/Decrease Statement: No change.				
Title: Tailorable Effects Fuzing Description: Develop 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). Develop initiation and multi-point technologies; electronic safe and arm based multi-point initiators for tunable output – scalable yield warheads; MicroElectro-Mechanical Systems (MEMS) based multi-point initiators for tunable output/scalable yield warheads; and smart fuzing for tailorable effects weapons. These technologies will enable weapons that can effectively defeat a variety of targets while minimizing unintentional collateral effects. FY 2019 Plans: Develop technologies for efficient/novel generation of firing energy for multi-point fuze systems. Develop fuzing components precision timing between initiation of multi-points and of energetic reactions. FY 2020 Plans: Develop technologies for efficient/novel generation of firing energy for multi-point fuze systems. FY 2019 to FY 2020 Increase/Decrease Statement: No change.		1.671	1.684	1.693
Title: High Reliability Fuzing Description: Develop high reliability fuzing architectures, fuzing components, and unexploded ordnance (UXO) reduction features. This program’s fuzing technologies are critical to enable the next generation of cluster munitions to achieve the required greater than 99 percent reliability. Evolving DoD emphasis on increased weapon system reliability is driving the need to consider new and novel approaches for achieving increased fuze reliability while maintaining or enhancing fuze design safety. DoD policy, higher weapon reliability expectations and harsher weapon system operational requirements are dictating the need for higher fuze reliability than available using current technologies. FY 2019 Plans:		1.802	1.772	1.781

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
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 2018	FY 2019	FY 2020
Develop integrated MEMS fuze sensor technology for applications in miniature UAV weapons such as Precision Acquisition Weapons System (PAWS) and BlackTip				
Demonstrate area-effects weapon fuzing subsystem and system-level prototypes and systems in both laboratory and field environments.				
FY 2020 Plans: Complete development MEMS fuze sensor technology for applications in miniature UAV weapons and transition into Precision Acquisition Weapons System (PAWS) Joint Capability Technology Demonstration (JCTD)				
FY 2019 to FY 2020 Increase/Decrease Statement: Increase of FY2019 funding will allow enabling technology development required for high reliability cluster munitions replacement applications.				
Title: Enabling Fuze Technologies		1.694	1.658	1.676
Description: Develop common/modular fuze architectures; innovative fuze component technologies; sensors; next generation fuze setting capability, tools, and modeling; and fuzing power sources. These fuzing technologies will provide smaller, more cost effective solutions while meeting or exceeding the performance of existing technologies. Development of these technologies will enable future weapon applications to be more mission adaptive and smaller along with improve target detection capabilities.				
FY 2019 Plans: Demonstrate miniaturized, low power, target detection device technologies in area-effect weapon simulated target environment testing. Develop miniature thermal battery technology to yield fast rise time and high power density required for small munitions.				
FY 2020 Plans: Develop miniature thermal battery technology to yield fast rise time and high power density required for small munitions.				
FY 2019 to FY 2020 Increase/Decrease Statement: No change.				
Accomplishments/Planned Programs Subtotals		6.573	6.531	6.574

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense			Date: February 2019
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603000D8Z / <i>Joint Munitions Advanced Technology</i>	Project (Number/Name) 301 / <i>Enabling Fuze Advanced Technology</i>	

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

<u>Line Item</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020</u> <u>Base</u>	<u>FY 2020</u> <u>OCO</u>	<u>FY 2020</u> <u>Total</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• 0602000D8Z P204: <i>BA2 Enabling Fuze Technology</i>	6.201	6.263	6.327	-	6.327	6.431	6.532	6.655	-	Continuing	Continuing

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

- 1) Transition of technologies developed by the Program are tracked and documented by technology maturity.
- 2) Fuze Area Technology Groups (FATG) Technology Roadmaps are prepared, evaluated, and analyzed by Joint Fuze Technology Program (JFTP) management and technical staff.
- 3) Chairman's Annual Assessments for each FATG are critically reviewed by the Technology Assessment Group and Technology Advisory Committee to ensure the JFTP is strategic focused and strong transitions into weapons and industry are taking place.
- 4) Project progress toward goals and milestones is assessed at each FATG meeting.
- 5) Annual technical reports and papers are tracked and documented for the Program.
- 6) Technology Transition Agreements are in place with Munition programs.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity					R-1 Program Element (Number/Name)							
0400: Research, Development, Test & Evaluation, Defense-Wide / BA 3: Advanced Technology Development (ATD)					PE 0603121D8Z / SO/LIC Advanced Development							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	0.000	0.000	0.000	5.000	-	5.000	5.100	5.202	5.306	5.412	Continuing	Continuing
121: SO/LIC Advanced Development	0.000	0.000	0.000	5.000	-	5.000	5.100	5.202	5.306	5.412	Continuing	Continuing

Note

Funding for SO/LIC Advanced Development was transferred from Combatting Terrorism Technology Support, PE: 0603122D8Z

A. Mission Description and Budget Item Justification

The SUNet enterprise system is an unclassified, secure information platform that allows the user to communicate, analyze, and share information between defense, interagency, and foreign partners. Rested on SUNet are mission specific enclaves used to detect, monitor, understand, and act in the information environment. The SUNet system addresses critical DoD and interagency requirements for an unclassified, secure information platform that jointly supports rapid innovation and RDT&E, combined operational missions, and mission partner information sharing. The SUNet provides defense and interagency partners with an accredited platform that enables secure unclassified information sharing, joint analysis, and advanced RDT&E in support of critical operational missions on a global scale. The platform currently supports 5000+ active users and 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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	0.000	0.000	0.000	-	0.000
Current President's Budget	0.000	0.000	5.000	-	5.000
Total Adjustments	0.000	0.000	5.000	-	5.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Program Transfer	-	-	5.000	-	5.000

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
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		
Change Summary Explanation Funding for SO/LIC Advanced Development was transferred from Combatting Terrorism Technology Support, PE: 0603122D8Z. These funds support the SUNet Enterprise System.				
C. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
Title: SUNet Enterprise System		0.000	-	5.000
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 5000+ active users and 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 2020 Plans: Initiate an effort to develop, integrate, test, deploy, manage and maintain a SUNet enterprise system with an emphasis on enhanced network engineering, information assurance, cybersecurity monitoring, enterprise governance and policy support, system redundancy and failover, and dedicated help desk to efficiently and effectively support a growing number of users and missions across the platform.				
FY 2019 to FY 2020 Increase/Decrease Statement: Funding for SUNet was transferred from Combatting Terrorism Technology Support, PE: 0603122D8Z				
Accomplishments/Planned Programs Subtotals		0.000	-	5.000
D. Other Program Funding Summary (\$ in Millions) N/A				
Remarks				
E. Acquisition Strategy N/A				

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
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
F. Performance Metrics N/A		

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** March 2019

Appropriation/Budget Activity					R-1 Program Element (Number/Name)							
0400: Research, Development, Test & Evaluation, Defense-Wide / BA 3: Advanced Technology Development (ATD)					PE 0603122D8Z / Combating Terrorism Technology Support							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	639.607	149.541	171.321	70.517	25.230	95.747	97.384	99.392	100.687	103.244	Continuing	Continuing
484: Combating Terrorism Technology Support (CTTS)	639.607	149.541	171.321	70.517	25.230	95.747	97.384	99.392	100.687	103.244	Continuing	Continuing

Note

OCO for Base Requirements (\$25,230): OCO for Base Requirements is OCO funding for base budget requirements in support of the National Defense Strategy. The Budget requests these funds in OCO to comply with the base budget defense caps included in the Budget Control Act of 2011.

A. Mission Description and Budget Item Justification

The Combating Terrorism Technical Support (CTTS) program identifies capabilities to combat terrorism and irregular adversaries and quickly delivers these capabilities to U.S. Defense and interagency users, as well as international partners through rapid research and development, advanced studies, and technical innovation. CTTS continues to expand its partnerships with other Defense and Interagency, as well as with our foreign partners' rapid development and acquisition organizations to leverage their expertise and prevent duplication as it tries to expedite and transition new and innovative capabilities for Defense and interagency users. CTTS is unique in its approach, annually obtaining joint requirements directly from military and law enforcement operators, intelligence analyst, and first responders.

CTTS recognizes that many of the combating terrorism requirements also support the 2018 National Defense Strategy and will address peer-to-peer high interest areas. These high priority areas include increasing lethal capability of U.S. forces at the squad and small unit level; countering Small Unmanned Aerial Systems (drones) overseas and domestically; tunnel detection and mapping in theater and along the Southwest U.S. border; novel body and vehicle armor; detecting and mitigating novel chemical threats against commercial transportation; telematics; covert communications; and the use of machine learning and artificial intelligence. From a broader perspective, projects remain distributed among 10 mission categories, in line with the interagency Technical Support Working Group (TSWG): Advanced Analytic Capabilities; Chemical, Biological, Radiological, Nuclear, and Explosives; Improvised Device Defeat/Explosives Countermeasures; Investigative and Forensic Science; Irregular Warfare and Evolving Threats; Personnel Protection; Physical Security; Surveillance, Collection, and Operations Support; Tactical Operations Support; and Training Technology Development.

The CTTS program is a diverse, advanced technology development effort that capitalizes on interagency and international participation to demonstrate the utility and effectiveness of technology when applied to combating terrorism requirements. It includes technology capability development, proof-of-concept demonstrations in field applications, and coordination to transition from development to operational use. CTTS manages approximately 250 individual projects in support of defense, federal, state, local, and international customers and partners.

The CTTS program justified in the R-2 exhibit identifies the projects fully or partially funded by Congressional appropriations for the CTTS program. However, Combating Terrorism Technical Support also develops technology and provides support using external funds provided by other DoD and federal departments and international partnerships. These projects and support activities are not necessarily reflected in this justification R-2; but the number of activities do reflect positively on the trust and competence that CTTS has earned throughout the Department of Defense and interagency to rapidly conduct critical RDT&E and provide innovative products.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: March 2019
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603122D8Z I <i>Combating Terrorism Technology Support</i>
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B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	101.083	150.271	75.517	0.000	75.517
Current President's Budget	149.541	171.321	70.517	25.230	95.747
Total Adjustments	48.458	21.050	-5.000	25.230	20.230
• Congressional General Reductions	-	-0.450			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	50.500	21.500			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-2.042	-			
• Funds re-aligned to SO/LIC Advanced Development BA: 03 PE: 0603121D8Z	-	-	-5.000	0.000	-5.000
• FY20 OCO Request	-	-	0.000	25.230	25.230

Change Summary Explanation

FY 2018 - The Department added additional OCO funds to support the Anti-Tunnel project under Physical Security

FY 2019 - The budget was reduced to fiscal constraints and higher priorities within the Department.

FY 2019 OCO request of 25.000 million was Congressionally directed to Base

FY 2019 The budget was increased for small unmanned aerial system

FY2020 - The budget reflects the adjustment for a one time cost.

FY2020 & FY2021 - Initially, OCO funds were to move to Base, however the Department reversed that decision. For FY2022 - FY2024 OCO has been realigned to Base.

C. Accomplishments/Planned Programs (\$ in Millions)

Title: Advanced Analytic Capabilities (AAC)

Description: The Advanced Analytic Capabilities (AAC) Subgroup's objective is to develop and deploy integrated analytic capabilities; enabling Commanders, Warfighters, and Mission Partners to share information and make better/faster decisions at the Strategic, Operational, and Tactical levels. AAC projects improve sense-making, decision-making, and data management across a range of mission areas.

FY 2019 Plans:

FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
9.567	6.161	6.537	-	6.537

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense				Date: March 2019		
Appropriation/Budget Activity 0400: Research, Development, Test & Evaluation, Defense-Wide I BA 3: Advanced Technology Development (ATD)		R-1 Program Element (Number/Name) PE 0603122D8Z I Combating Terrorism Technology Support				
C. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Complete the Model Enabled Analysis, Design, and Execution (MEADE) capabilities by including user feedback in follow-on development, including cost data and return on investment analytics. Complete development of an ability to extract images from the field and make them useable for digital processing using Optical Character Recognition (OCR) processing so that the images can be used in commercial Arabic translation software. Complete enhancement of Study of Terrorism and Responses to Terrorism (START) Database, updating data, increasing the speed of data refinement, exploring new methodologies, optimizing extant methodologies, and providing data to other Research and Development groups inside and outside of government who need similarly driven innovation. Continue the tagging and retrieval of objects from images for the purpose of analysis and real time alerts using machine learning. Continue efforts to enhance capability of experimental software to meet SOF requirements and improve the probability of the software's rapid and successful integration or transition to operational use at SOFWERX in a sandbox-style environment which sources end-users feedback to the vendor. Continue 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. Continue development and demonstration of software capable of using open source and other available information to develop a detailed country model comprising of iterative models for national, provincial, and local organizational elements across political, economic, military, socioeconomic and cultural domains. Initiate development of a mesh network of Field Programmable Gate Array-based mobile devices for conducting high-performance mobile edge analytics without reach-back to the cloud, enabling support of edge analytics in end-user specified use-cases. Initiate development of a computer vision algorithm in order to provide a capability to tag and track a region of interest, such as targeted individuals, vehicles, and/or friendly forces. Initiate development of automated software tools for data exploration and extrapolation to derive insight into social networks. FY 2020 Base Plans: Complete the tagging and retrieval of objects from images for the purpose of analysis and real time alerts using machine learning. Complete efforts to enhance capability of experimental software to meet SOF requirements and improve the probability of the software's rapid and successful integration or transition to operational use at SOFWERX in a sandbox-style environment which sources end-users feedback to the vendor. Complete 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. Complete development and demonstration of software capable of using open source and other available information to develop a detailed country model comprising of iterative models for national, provincial, and local organizational elements across political, economic, military,						

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C. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
<p>socioeconomic and cultural domains. Complete development of a mesh network of Field Programmable Gate Array-based mobile devices for conducting high-performance mobile edge analytics without reach-back to the cloud, utilizing the platform to support analytics in end-user designated use-cases. Complete development of a computer vision algorithm in order to provide a capability to tag and track a region of interest, such as targeted individuals, vehicles, and/or friendly forces. Complete development of automated software tools for data exploration and extrapolation to derive insight. Complete drone based analytics for in-field mission planning support. Initiate development of a data ingestion, storage, formatting and processing system which refines and stores information-products both in a high-throughput data and application environment and deployable as remotely accessible images in support of edge analytics. Initiate development of a methodology to model elicit pathways of travel which leverage topographic, geographic and cultural analytics to predict probable routes and avenues of movement. Initiate development of a solution for enhancing data I/O in battlefield mobile supercomputers which accelerates data throughput to and from permanent memory to the CPU/GPU via data transfer pathways. Initiate development of a system capable of detecting, locating, recording, and analyzing sources of radiated electromagnetic energy for autonomous RF signal collection management.</p> <p><i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> Minor changes and increases are reflective of departmental priorities..</p>						
<p><i>Title:</i> CHEMICAL, BIOLOGICAL, RADIOLOGICAL, NUCLEAR, AND EXPLOSIVES (CBRNE)</p> <p><i>Description:</i> 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.</p> <p><i>FY 2019 Plans:</i> Complete development of an easy-to-understand, standardized, evidence-based fire training program addressing shortcomings in current fire safety and survival training. Complete modification of currently fielded ion mobility spectroscopy systems to expand the list of threats detectable to include compounds from emerging military explosives and compounds used in gun powder formulations. Complete development of a test bed for the evaluation of cargo for contraband including special nuclear materials, explosives, drugs, and other potential materials of interest, utilizing muon tomography and electron stopping. Complete development of a research and development test bed for the evaluation of high volume explosive sampling devices with a focus on cargo/</p>		8.836	10.026	9.348	0.662	10.010

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C. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
<p>container screening. Complete development of a risk-based decision support model for skin decontamination in the case of dermal exposures to CWAs. Complete the systematic evaluation of gas forming reactions that could be used in improvised chemical devices. Complete development of a modular computer/web-based training package for hand-held explosive detection technologies. Complete NIOSH certification of a new CB protective mask capable of interoperability with tactical equipment for use in tactical environments. Complete NIOSH certification of a 15-min CBRN protection escape hood capable of fitting in the pocket of a suit jacket that also passes the flammability, heat resistance and CO protection requirements for a combination CBRN/CO capability. Complete testing new methods to more effectively and efficiently collect nanogram quantities of commercial, military, and homemade explosives that are present near improvised explosive devices. Complete development of new hardware and software solutions for a broad range of popular handheld detectors, enabling the real-time connectivity of handheld detectors from remote sites to a central location utilizing the First Responder Sensor Protocol. Complete CBRN respirator testing against additional TICs representative of the current threats encountered. Complete testing and evaluation of a next generation sensors for use in trace, bulk, proximity, and stand-off detection of explosives-based threats. Complete evaluation of enhanced sampling materials and systems for CBRNE threats. Complete development of an explosive trace detector with a limit of detection less than ten picograms for military and common homemade explosives. Complete efforts to better understand microbial associations within complex microbial communities. Complete enhancing mitigation techniques to reduce the impact of threat releases in transportation platforms and confined spaces. Complete source term development for urban dispersion models to improve the characterization of deposition patterns in realistic radiological dispersion device (RDD) events. Identify best practices for clean-up procedures of contaminated areas after an RDD event. Complete development of low-cost, commercially available detect-to-warn detector for aerosol and vapor chemical hazards, low explosive limit hazards, and enriched/deficient oxygen levels from background. Complete development of a CB glove providing National Fire Protection Association (NFPA) 1994, Class 3, protection with greater tactility, durability, dexterity, and comfort. Complete development of an explosive simulant that supports screening procedures/technology evaluations without posing an explosive hazard. Complete an industry challenge to identify an efficient swab solution compatible with fielded detection technologies and that meets practical operational considerations. Continue 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. Continue 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. Continue development of a low-cost detect-to-identify wearable sensing technology to inform chemical-specialist first responders and warfighters of the presence of a broad range of TIC and CWA vapors. Continue development of an advanced analytical database of improvised Chemical and Biological agent production methods. Continue</p>					

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development of a commercialized capability to produce aerosolized chemical and biological hazards for threat characterization. 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 identifying successful operational guidance for decontaminating fentanyl and its analogs. Continue improvement of a previous biological detector prototype to enhance performance and detection capabilities. Initiate the development of a decontamination solution that can be used on skin and wounds and effectively decontaminate chemical and biological warfare agents. Initiate 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. Initiate development of low cost chemical sensors for deployment in a network based sensor environment for large area coverage or temporary venue screening of vapor or aerosol chemical threats in transit or outdoor areas. Initiate development of a man-portable system that can reliably detect explosives through continuous gas phase monitoring. Initiate development of a wearable solution that autonomously monitors, detects, and captures threat agents for identification. Initiate development of a new universal suit seal interface (USSI) to accommodate a broader range of masks and personal protective ensembles. Initiate development of an interface that integrates chemical detection data in real time to a central data sharing, management, and storage platform. Initiate development of an online database containing feedback on CBRNE detector field performance and test data. Initiate assessment of CBRN filter canister performance under various storage configurations. Initiate an industry challenge to identify functional and improved technologies for securing protective capabilities against CBRN hazards FY 2020 Base Plans: 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 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 development of a low-cost detect-to-identify wearable sensing technology to inform chemical-specialist first responders and warfighters of the presence of a broad range of TIC and CWA vapors. Complete development of an advanced analytical database of improvised CB agent production methods. Complete development of a commercialized capability to produce aerosolized chemical and biological hazards for threat characterization. Complete identifying successful operational guidance for decontaminating fentanyl and its analogs. Complete improvement of a previous biological detector prototype to enhance performance and detection capabilities. Complete development of low cost chemical sensors for deployment in a network based sensor environment for large area coverage or temporary venue						

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screening of vapor or aerosol chemical threats in transit or outdoor areas. Complete development of an online database containing feedback on CBRNE detector field performance and test data. Complete assessment of CBRN filter canister performance under various storage configurations. Complete an industry challenge to identify functional and improved technologies for securing protective capabilities against CBRN hazards. Continue the development of a decontamination solution that can be used on skin and wounds and effectively decontaminate chemical and biological warfare agents. Continue 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. 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 development of a man-portable system that can reliably detect explosives through continuous gas phase monitoring. Continue development of a wearable solution that autonomously monitors, detects, and captures threat agents for identification. Continue development of a new USSI to accommodate a broader range of masks and personal protective ensembles. Continue development of an interface that integrates chemical detection data in real time to a central data sharing, management, and storage platform. Initiate the development of a respiratory protective device designed for canines that can fit the general working dog population. Initiate the development of a packaging system for rapidly containing and safely transporting corrosive chemical warfare agents, biological warfare agents, explosive samples, and other substances harmful to human health to include chemical filled military munitions. Initiate the development of a next-generation HazMat Boot that provides NFPA 1994 protection, and provide a more comfortable, functional, and cost-effective solution than available certified products. Initiate the development of a cost efficient handheld Raman spectrometer for identification of threat materials using COTS hardware, open-source software capable of importing a US government developed Raman library. Initiate validation methods to confirm routine decontamination of personal protection equipment is sufficient to remove emerging threats like toxins (ricin, abrin) or drugs (opioids, fentanyl analogs). Initiate updating transportation and indoor models, dermal risk assessment model, and adversary models, and characterize the stability and persistence of opioids in food and water matrices. Initiate the development of a screening system capable of simultaneously screening passengers and bags carried by passengers for mass casualty weapons. Initiate the redesign of the current vacuum sampling devices to accommodate collection of liquid samples for chemical or microbiological forensic analysis. Initiate the characterization of determining the effectiveness of novel delivery methods through empirical data to better understand the potential hazard and develop detection/mitigation methods for a broad range of materials delivered via those mechanisms. Initiate the development of evidence and consensus-based guidance for laundry protocols and decontamination confirmation for personal protective equipment after ricin, abrin, and pharmaceutical-based agent incidents. Initiate the development of a compact,						

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hands-free device that shall continually monitor the air quality in sub-terrarium environments and automatically notify users of dangerous conditions. FY 2020 OCO Plans: Initiate the development of a small, lightweight self-contained breathing apparatus (SCBA) that allows a user to continue shooting in an underground facility. FY 2019 to FY 2020 Increase/Decrease Statement: Minor changes and increases are reflective of departmental priorities.						
Title: IMPROVISED DEVICE DEFEAT (IDD) Description: The IDD/EC Subgroup’s objective is to deliver capabilities to defeat or neutralize the continuum of terrorist improvised weapons and explosive devices. IDD/EC improves the operational capabilities of the bomb disposal community, consisting of military Explosive Ordnance Disposal (EOD), and federal, state, and local bomb squads, by developing and delivering advanced tools and technologies, and decision support information to defeat improvised terrorist devices. The IDD/EC Subgroup identifies and prioritizes multi-agency end-user requirements in collaboration with military units, and federal, state, and local agencies. IDD/EC actively works with vendors and end-users to deliver advanced prototype systems that provide greater efficiency and increased safety for bomb technicians who investigate, access, evaluate, and if needed, render safe or dispose of suspect devices. All development efforts undertaken are in support Presidential Policy Directive 17 (PPD-17), Countering Improvised Explosive Devices, and the National Bomb Squad Commanders Advisory Board (NBSCAB) National Strategic Plan. FY 2019 Plans: Complete development of a device defeat application that allows bomb technicians to select disruption tools based on automated X-ray diagnostics. 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 small, high definition, live-streaming camera that displays images onto a wearable screen or heads-up display. Complete development of a library of computer-assisted-drawings (CAD) files that can be downloaded from a website and printed with an inexpensive 3D printer at the bomb squad location or sourced to outside parties for printing. Complete development of a rapidly mountable backscatter X-ray system for small to medium sized robotic platforms. Complete development of a humanoid robotic platform prototype for use IED Defeat operations in urban environments. Complete development of an optimized IED jamming system that includes updated		9.218	13.178	7.296	0.456	7.752

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frequencies and increased jamming power based on a pre-existing system. Continue conducting workshops that integrate Explosive Ordnance Disposal (EOD) and Public Safety Bomb Technicians (PSTB) with engineers and roboticists to collaboratively design and develop new capabilities for VBIED response. Continue an East Coast-based technology requirement gathering capability exercise (TRG CAPEX) to develop and test advanced skills to maneuver hazardous duty robots in challenging, real-world scenarios. Continue development of a mixed-reality visualization system for command post/up-range support that will allow bomb technicians and support personnel to see what is transpiring downrange and assist the bomb technician with on-scene analysis. Continue development of bomb disposal tools for deployment on, or by, small UAS-based platforms. Continue development of a low cost obstruction avoidance and proximity alert system for robotic platforms. Continue development of an electronic, user-updatable UAS Guidebook that can be used as a quick reference guide during response operations for identification and analysis of downed UAS platforms. Continue development of a smartphone or tablet-based application that will allow bomb technicians to relay IED and IED incident information graphically to fellow bomb technicians in real-time. Continue development of a humanoid robotic platform for use IED Defeat operations in urban environments. Continue research to produce customizable energetic tools to disrupt explosive devices in high risk environments. Continue bilateral information exchange between U.S.-based bomb technicians and members of the Israel National Police Bomb Disposal Division. Initiate sponsorship of a requirement gathering event where individual bomb technicians compete against one another in skill-based challenges. Initiate development of a digital night vision system capable of producing full color images of items, reflective of their actual color to aid component identification and diagnostics. Initiate development of an add on device that can attach to or be placed in front of an electronic display screen to mitigate degraded visibility caused by ambient bright light. Initiate development of a small, wireless, ground robot able to autonomously map the interior of a structure. Initiate development of an underwater firing system that is ROV platform agnostic and can operate at depths down to 99 feet. Initiate development of a robotic platform designed to operate on rail systems and underground infrastructure for inspecting rail cars and locomotives. Initiate development of library of IED circuits for training, which contains component lists, assembly instructions, and files for making printed circuit boards.						
FY 2020 Base Plans: Complete development of a mixed-reality visualization system for command post/up-range support that will allow bomb technicians and support personnel to see what is transpiring downrange and assist the bomb technician with on-scene analysis. Complete development of bomb disposal tools for deployment on, or by, small UAS-based platforms. Complete development of a low cost obstruction avoidance and proximity alert system for robotic platforms. Complete development of a smartphone or tablet-based application that will						

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allow bomb technicians to relay IED and IED incident information graphically to fellow bomb technicians in real-time. Complete research to produce customizable energetic tools to disrupt explosive devices in high risk 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 VBIED response. Continue an East Coast-based technology requirement gathering capability exercise (TRG CAPEX) to develop and test advanced skills to maneuver hazardous duty robots in challenging, real-world scenarios. Continue development of an electronic, user-updatable UAS Guidebook that can be used as a quick reference guide during response operations for identification and analysis of downed UAS platforms. Continue development of a humanoid robotic platform for use IED Defeat operations in urban environments. Continue bilateral information exchange between U.S.-based bomb technicians and members of the Israel National Police Bomb Disposal Division. Continue sponsorship of a requirement gathering event where individual bomb technicians compete against one another in skill-based challenges. Continue development of a digital night vision system capable of producing full color images of items, reflective of their actual color to aid component identification and diagnostics. Continue development of an add on device that can attach to or be placed in front of an electronic display screen to mitigate degraded visibility caused by ambient bright light. Continue development of a small, wireless, ground robot able to autonomously map the interior of a structure. Continue development of a robotic platform designed to operate on rail systems and underground infrastructure for inspecting rail cars and locomotives. Continue development of library of IED circuits for training, which contains component lists, assembly instructions, and files for making printed circuit boards. FY 2020 OCO Plans: Continue development of an underwater firing system that is ROV platform agnostic and can operate at depths down to 99 feet. FY 2019 to FY 2020 Increase/Decrease Statement: Decreases due to changes in Congressional Add funding.						
Title: INVESTIGATIVE AND FORENSICS SCIENCE Description: The IFS subgroup’s objective is to advance combating terrorism capabilities in investigative and forensic science. IFS supports joint, interagency, and other partners who apply investigative and forensic science methods, means, or practices to forensic intelligence or investigations. To meet this objective, the subgroup focuses on rapid research, development, test and evaluation of new and advanced technology, equipment, forensic techniques, and investigative tools, as well as development of information resources and on support tools for risk-based decision-making and rapid exploitation of evidence. Projects emphasize rapid and		7.805	7.436	11.114	-	11.114

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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.						
<p>FY 2019 Plans:</p> <p>Complete development and fielding of a handheld device that can document incident scenes and collect fingerprint images and can make comparisons at the scene with other databases. Complete the research to determine the best credibility assessment techniques and procedures to be used on persons living in the regions around Israel and distribute the results. Complete the research, production, and fielding of a field handbook describing the procedures used by the Five Eyes nations in exploiting tactical and sensitive sites for forensic and investigative information. Complete the development and fielding of standard protocols, procedures, and best practices for forensic speaker comparison examiners to accomplish their analyses and examinations. Complete the development and fielding of a miniature concealable body worn audio-video transmitter for law enforcement and tactical personnel. Complete development and fielding of DNA collection and analysis procedures usable in sensitive sites and restricted areas without leaving any trace. Continue the development of an advanced scalable facial recognition system based on a government developed model. Continue the development of automated methods to convert foreign fingerprint and biometric files into US compatible electronic files and anonymize the source of the data and a start building a hardware device for faster file ingesting. Continue the development of a facial recognition toolkit that can quickly identify facial images at sensitive sites. Initiate the development and evaluation of algorithms that increase the accuracy of NCCA's Avatar and thermal imaging credibility assessment systems. Initiate the development of a mobile instrument with a deep UV Raman laser that visualizes undetectable latent fingerprints and makes the images immediately available for analysis. Initiate development of a vehicle image search tool with artificial intelligence that automatically trains itself to identify new makes and models of vehicles for future analysis. Initiate the development of an automatic video file search and analysis tool for any user defined object to collect evidence and intelligence.</p> <p>FY 2020 Base Plans:</p> <p>Complete the development and fielding of an advanced scalable facial recognition system based on the government developed model. Complete the development and fielding of automated methods to convert foreign fingerprint files into US compatible electronic files and anonymize the source of the data and complete building a hardware device for faster file ingesting. Complete the development and fielding of a facial recognition toolkit that can quickly identify facial images at sensitive sites. Complete the development and evaluation of algorithms that increase the accuracy of NCCA's Avatar and thermal imaging credibility assessment systems. Complete</p>						

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the development and delivery of a mobile instrument with a deep UV Raman laser that visualizes undetectable latent fingerprints and makes the images immediately available for analysis. Complete development and field of a vehicle image search tool with artificial intelligence that automatically trains itself to identify new makes and model of vehicle for future analysis. Continue the development of an automatic video file search and analysis tool for any user defined object to collect evidence and intelligence. Initiate the development of forensic procedures to collect and analyze both DNA evidence and latent fingerprint evidence found on adhesive tape and related media. Initiate 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 portable device that can identify inorganic material and determine its geo-location of origin. Initiate development of an automated system that rapidly searches large data files to detect, classify, and retrieve weapons, symbols, and other objects. Initiated development of a portable long range facial identification system that operates accurately up to 300 meters. Initiate 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. Initiate development of a system for audio recordings that finds and labels noises of law enforcement interest and intelligence value. Initiate development of advanced Latent Quality Metric software that standardizes and makes the latent print comparison workflow more efficient and accurate. Initiate development of a rugged, mobile, forensic alternative light source for better visualization and photographing of trace evidence. Initiate development of an automated process to enhance the clarity, detail, and pixel level of low resolution images. FY 2019 to FY 2020 Increase/Decrease Statement: Increases are reflective of departmental priorities.						
Title: Irregular Warfare and Evolving Threats (IW/ET) Description: The IW/ET subgroup develops new concepts and capabilities for warfighters and inter-agency partners. In accordance with the Quadrennial Defense Review’s (QDR) emphasis on preparation to defeat adversaries and succeed in a wide range of contingencies, IW/ET will engage in operational assessment, concept development, and independent validation of unique prototype capabilities to identify, confront, and defeat evolving threats. FY 2019 Plans: 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		12.111	15.248	5.544	3.046	8.590

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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. Observations will examine how to advance virtual communications between advisors and partners during operations. Continue 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. Continue the development of a platform to collect and analyze photographs, videos, audio recordings, and general text-based information via precise crowd sourcing techniques. The technical approach provided the capability to conduct facial, object and ISIL branded recognition. An Android-based application is also 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 communicators to collect, search, retrieve, view and analyze photos, audio, and video for use. Continue an effort to manage, develop, enhance, integrate, test, deploy, and maintain a Secure, Unclassified, Network (SUNet) enterprise system that allows the user the ability to detect, monitor, understand, and act in the information environment through mission specific enclaves (partitioned mission or function information cells). Continue Phase 1 of a project characterizing the use of commercial tech by various actors (political actors, brands, competitors), which will inform and support the experimentation and prototyping efforts of Phase 2. Phase 2 will explore commercial tech identified in Phase 1 to develop at least one software prototype. Initiate development of a capability that can deploy, through air drop, large quantities of electronic devices that will land within a predesignated area safely. The deployment containers will draw the attention of the local populace in both the air and on the ground, will float and be watertight. This will provide Military Information Support Operations 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. Initiate creating 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. Initiate research exploring the rapidly evolving field of Deep fakes to understand its effect and evaluate options. Initiate new efforts to develop and deploy capabilities that support						

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DoD, interagency and foreign partners and allies who are confronting evolving threat networks and complex global operational environments. FY 2020 Base Plans: 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. Complete the development of a platform to collect and analyze photographs, videos, audio recordings, and general text-based information via precise crowd sourcing techniques. The technical approach provided the capability to conduct facial, object and ISIL branded recognition. An Android-based application is also 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 communicators to collect, search, retrieve, view and analyze photos, audio, and video for use. Complete Phase 2 of a project characterizing the use of commercial tech by various actors (political actors, brands, competitors). Phase 2 will explore commercial tech identified in Phase 1 to develop at least one software prototype. Complete development of a capability that can deploy, through air drop, large quantities of electronic devices that will land within a predesignated area safely. The deployment containers will draw the attention of the local populace in both the air and on the ground, will float and be watertight. This will provide Military Information Support Operations (MISO) operators the ability to deliver more complex and tailored messages to targeted populations in a safe and controllable manner, advancing the current capability of leaflet drop operations. 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. Complete research exploring the rapidly evolving field of Deep fakes to evaluate its effect and evaluate options. Initiate transition to a new PE line an effort to manage, develop, enhance, integrate, test, deploy, and maintain a Secure, Unclassified, Network (SUNet) enterprise system that allows the user the ability to detect, monitor, understand, and act in the information environment through mission specific enclaves (partitioned mission or function information cells). Initiate project to support MISO operators by integrating cutting edge commercial technologies and applications into a toolkit that consist of advanced equipment that reflect the technology and communications infrastructure in the diverse set of environments in which MISO operates. The toolkit shall be influence-specific, standardized and by design be interchangeable,						

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C. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
to include capabilities that can be procured on the local economy of the country of interest. Initiate an effort to explore the emerging blockchain technologies and the risks and opportunities posed by them with respect to United States national security interests. If pursued, these projects will improve USG understanding of the Encrypted Ledger. The impact and transition pathway will be determined once a proposal is approved and aligned with end-user specific needs and timelines. Initiate new efforts to develop and deploy capabilities that support DoD, interagency and foreign partners and allies who are confronting evolving threat networks and complex global operational environments. FY 2020 OCO Plans: Initiate project to develop a multiuser, near real-time game that can simulate irregular threats. The platform will leverage large all-source data sets to create various wargaming scenarios with built-in parameters. Once the game has used that data to set the scenario, organizers will virtually invite stakeholders, SMEs, and relevant partners to form a secure user base. Once the game begins, participants will collaborate and compete in real time under assigned roles for COA development, refinement, and assessment while interacting with all other users. The simulation platform will record all wargaming interactions amongst users and generate a secure cloud-based database FY 2019 to FY 2020 Increase/Decrease Statement: Changes and reductions are reflective of departmental priorities.						
Title: PERSONNEL PROTECTION Description: The Personnel Protection Subgroup’s objective is to develop new equipment, reference tools, and standards to improve the protection of personnel. Projects focus on putting innovative tools such as automated information management systems, communication devices, tagging, tracking and locating devices, mobile surveillance systems, as well as personal and vehicle protection equipment in the hands of personnel. FY 2019 Plans: Complete development of a helmet system to protect against common high power rifle projectile threats. Complete the development of a test apparatus that serves to measure dynamic and static events during and after the course of a ballistic impact. Complete development of a mobile sensor suite that can detect subsonic and supersonic rounds that are fired at convoy and display it on a real time map to provide situational awareness to the operator. Complete development of systems to enhance situational awareness, intelligence collection capabilities, and personnel recovery efforts. Complete development of biomarker identification		14.597	20.077	9.412	0.753	10.165

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C. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
for brain injury using magnetic resonance imaging (MRI) and magnetic resonance spectroscopy (MRS) to monitor neurochemical biomarkers for post-traumatic stress disorder and mild traumatic brain injury. Complete development of 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 small lightweight wearable device that securely transmits biometric and geolocation data to a common operating picture. Complete the development of a multi-modal system to detect, identify and mitigate unmanned aerial threats to tactile vehicles and other mobile platforms in terrestrial and maritime environments. Complete development of an air deployable unmanned aerial system that is capable of dashing ahead of the V-22 and providing at least 8.5 minutes of overhead intelligence, surveillance and reconnaissance (ISR) at the landing zone or drop zone prior to the force arrival. Continue development of standalone armor plates to defeat the 7.62 X 39mm, 124 grain, mild steel core (MSC) projectile. Continue development of a robust Electromyography (EMG) sensor system comprised of electrodes, sampling electronics and processing electronics capable of integration into a robotic/human augmentation platform. Continue the development of advanced systems to detect and mitigate unmanned aerial threats using novel detection and mitigation modalities. Initiate development of enhanced performance personal body armor and production processes to enable successful completion of first articles tests and subsequent fielding. Initiate development of an active counter small unmanned aerial vehicle system that will employ a multi-rotor UAV to capture, retrieve and neutralize threat UAV systems. Initiate development of an updated Armored Passenger Vehicle (APV) Handbook with regards to the current management of government APV programs. Initiate the investigation of the root causes of poor armor fit among U.S law enforcement agencies. Identify corrective actions and standard procedures to ensure proper fit to body armor users across the anthropometric spectrum of law enforcement professionals. Initiate the development of a vehicle mounted, tethered aerial platform capable of carrying a wide variety of payloads to fill various mission needs. Initiate the development of a test fixture to validate the performance of non-pneumatic limb tourniquets. Initiate 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. Initiate development of a system capable of UAS detection, geolocation, tracking and disruption for the protection of dismounted soldiers and operators. Initiate development and testing of injection molded ceramic armor to provide interagency vehicle with ballistic protection from advanced projectile threats.						
FY 2020 Base Plans: Complete development of standalone armor plates to defeat the 7.62 X 39mm, 124 grain, mild steel core (MSC) projectile. Complete development of a robust Electromyography (EMG) sensor system comprised of electrodes, sampling electronics and processing electronics capable of integration into a robotic/human						

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C. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
augmentation platform. Complete the development of advanced systems to detect and mitigate unmanned aerial threats using novel detection and mitigation modalities. Complete development of an active counter small unmanned aerial vehicle system that will employ a multi-rotor UAV to capture, retrieve and neutralize threat UAV systems. Complete development of an updated Armored Passenger Vehicle (APV) Handbook with regards to the current management of government APV programs. Complete the development of a test fixture to validate the performance of non-pneumatic limb tourniquets. Complete development and testing of injection molded ceramic armor to provide interagency vehicle with ballistic protection from advanced projectile threats. Continue development of enhanced performance personal body armor and production processes to enable successful completion of first articles tests and subsequent fielding. Continue the investigation of the root causes of poor armor fit among U.S law enforcement agencies. Identify corrective actions and standard procedures to ensure proper fit to body armor users across the anthropometric spectrum of law enforcement professionals. Continue the development of a vehicle mounted, tethered aerial platform capable of carrying a wide variety of payloads to fill various mission needs. Continue the development of a heads up display unit to be integrated into an existing helmet system and provide day and night display of data elements of interest to the operator. Continue development of a system capable of UAS detection, geolocation, tracking and disruption for the protection of dismounted soldiers and operators. Initiate development of advanced ceramic materials with enhanced mechanical properties for use in novel armor applications. Initiate development of innovative materials for use in advanced armor systems. Initiate development of a two dimensional polymer material bound by robust hydrogen bonds for 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 multi-threat helmet to provide impact and ballistic and ballistic protection for law enforcement officers. Initiate development of a 360 degree, real time sensor system to provide streaming video and anomaly detection to vehicle platforms on the move. FY 2020 OCO Plans: Initiate development of a discrete, self-adhesive patch that provides silent, tactile stimulation in order to alert embassy personnel alert notifications. FY 2019 to FY 2020 Increase/Decrease Statement: Decrease due to changes in Congressional Add funding.						
Title: PHYSICAL SECURITY		53.064	56.746	5.493	1.962	7.455
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						

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C. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
in the focus areas of Blast Effects and Mitigation; Maritime Security; Screening, Observation, Detection, and Protection; and, Subterranean Activities. Emphasize these technology development efforts primarily at U.S. embassies and consulates, forward operating bases, along the U.S. borders, at mass transportation and commerce nodes, in maritime port and littoral environments, and in support of large scale public venues. FY 2019 Plans: Complete development of an automatic target recognition system for on the move, standoff IED detection. Complete development of an Advanced Diver Data Display System final prototype for combat swimmers. Complete development of a portable and ruggedized body scanner for personnel protection missions based on the existing AIT stationary body scanner system developed by Tek84. Complete development and evaluation of a scanning system able to maneuver independently inside specified geology target areas and provide situational awareness. Complete testing on localized responses from facades to quantify the effects of responding components on blast propagation through a new series of controlled explosive tests at the Urban Canyon Test facility. Complete development of a joint multi-disciplinary geology survey kit, comprised of distinct tools. Complete development of a software tool associated with a comprehensive evaluation of horizontal directional drilling (HDD) equipment to be used to focus intelligence collection and threat assessments and provide leadership with enhanced situational awareness to allocate limited resources to high risk areas. Complete the design and installation of a novel concept for an underground training and tactical test site in the United States, for training operators and testing and evaluating tactical technologies. Complete development of a larger version of a technology used to block entrances or doorways with time delay and cart for system transport. Complete development of a prototype communications system for special missions in specified environments. 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 improved, cost-effective High Power Radio Frequency (HPRF) sources for nonlethal vessel and vehicle stopping that achieve militarily useful effective ranges against fast moving target. Complete development of a roller door that is forced-entry (FE) resistant and capable of meeting the State Department 15-Minute FE performance criteria. Complete the development of an in-depth guide of best practices for rescuing tunnel collapse victims inside OSHA-compliant and non-compliant tunnels to enhance survivability. Continue development of a portable and ruggedized body scanner for personnel protection missions based on the existing AIT stationary body scanner system developed by Tek84. Continue construction of a test site in a specific geographic region for testing emerging technologies for unique operational missions. Continue development of an advanced active diver thermal protection system for long exposure dives, including SEAL Delivery Vehicle (SDV) operations. Continue development of decision aids for first responders and military engineers by testing explosives effects in an urban environment, to include						

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C. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
<p>Historic Masonry and frangible front structures. Continue development of a novel platform that incorporates the integration of proven land-based sensors for conducting advanced geology surveys. Continue development of a mobile system for standoff detection and mapping of specified geology phenomena using technology developed under previous bilateral tasks. Continue development, integration and T&E of an extended coverage system for novel border protection applications in different terrain/geology conditions. Continue development of additional mission capabilities to the Sappheiros unattended ground sensor system to enable deployment, detection and tracking of targets in various geology environments. Continue development of a prototype system and concept of operations based on the use of transmitters and receivers to detect a particular geology phenomenon. Continue development of an algorithm for detecting weapons in baggage that will be integrated into existing baggage x-ray systems. Continue the testing and evaluation of the use of binary explosives for unique applications in specific environments. Continue development of a small, unmanned aerial system (sUAS) to safely conduct reconnaissance of discovered illicit tunnels and routine inspections of underground municipal infrastructure (UMI). Continue modification of a novel system to enable communication among a network of multiple users and at longer ranges. Continue development of a tactical spray-on reinforcement kit for potentially dangerous structures. Continue development of a self-positioning personnel tracking system. Continue development of a fast-running ultra-high performance concrete slab model, WAC-U, and improved tools for design, protective use, and vulnerability assessments. Continue development of a new capability for the modeling of tunnel IED effects within the Vulnerability Assessment and Protection Option (VAPO) software tool and for rendering tactical tunnels unusable through predictive blast modeling. Continue development of a tactical and easy-to-use tool that will enable an operator to see behind obstacles (e.g. brick walls, sandbags, doors, etc.), from a safe distance, in underground confined structures. Continue 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. Continue development and test of a man-portable, self-propelled module that can advance through confined spaces, support real time day or night video transmission, and provide a fresh air supply. Initiate development of a novel ship-to-shore fuel transport system in an amphibious towable container that mitigates risk to personnel and fuel loss in the event of an attack. Initiate adaptation of a proven land system to a novel type of detection system. Initiate development and evaluation of an airborne system that can detect specific infrastructure aspects without requiring line of sight. Initiate the test and evaluation of a low-cost compressed air storage system for the rapid evacuation of personnel from confined subterranean spaces, for both training and operational applications. Initiate development and evaluation of a mechanical system for blocking tunnel entrances and shafts that provides the same or improved capability as the chemical-reaction-based first generation tunnel block system. Initiate development of reports compiling recent domestic and international terrorist events involving person-borne and vehicle-borne improvised</p>						

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C. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
explosive device (PBIED & VBIED) events, including location, threat, success or failure factors and overall impact. Initiate test and evaluation of Ethylene-vinyl Acetate (EVA) laminated glass to determine its blast protection performance as compared to Polyvinyl Butyral (PVB) laminated glass. FY 2020 Base Plans: Complete development of a portable and ruggedized body scanner for personnel protection missions based on the existing AIT stationary body scanner system developed by Tek84. Complete construction of a test site in a specific geographic region for testing emerging technologies for unique operational missions. Complete development of an advanced active diver thermal protection system for long exposure dives, including SEAL Delivery Vehicle (SDV) operations. Complete development of decision aids for first responders and military engineers by testing explosives effects in an urban environment, to include Historic Masonry and frangible front structures. Complete development of a novel platform that incorporates the integration of proven land-based sensors for conducting advanced geology surveys. Complete development of a mobile system for standoff detection and mapping of specified geology phenomena using technology developed under previous bilateral tasks. Complete development, integration and T&E of an extended coverage system for novel border protection applications in different terrain/geology conditions. Complete development of additional mission capabilities to the Sappheiros unattended ground sensor system to enable deployment, detection and tracking of targets in various geology environments. Complete development of a prototype system and concept of operations based on the use of transmitters and receivers to detect a particular geology phenomenon. Complete development of an algorithm for detecting weapons in baggage that will be integrated into existing baggage x-ray systems. Complete the testing and evaluation of the use of binary explosives for unique applications in specific environments. Complete development of a small, unmanned aerial system (sUAS) to safely conduct reconnaissance of discovered illicit tunnels and routine inspections of underground municipal infrastructure (UMI). Complete development of adapting a proven land system to a new type of platform detection. Complete modification of a novel system to enable communication among a network of multiple users and at longer ranges. Complete development of a tactical spray-on reinforcement kit for potentially dangerous structures. Complete development of a self-positioning personnel tracking system. Complete development of a fast-running ultra-high performance concrete slab model, WAC-U, and improved tools for design, protective use, and vulnerability assessments. Complete development of a new capability for the modeling of tunnel IED effects within the Vulnerability Assessment and Protection Option (VAPO) software tool and for rendering tactical tunnels unusable through predictive blast modeling. Complete development of a tactical and easy-to-use tool that will enable an operator to see behind obstacles (e.g. brick walls, sandbags, doors, etc.), from a safe distance, in underground confined structures. Complete development and testing of a less-than-lethal-						

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C. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
weapon (LLW) prototype that fires pepper projectiles with improved accuracy at extended ranges, enabling engagement of adversaries from a safer distance. Complete development and test of a man-portable, self-propelled module that can advance through confined spaces, support real time day or night video transmission, and provide a fresh air supply. Complete development and evaluation of a mechanical system for blocking tunnel entrances and shafts that provides the same or improved capability as the chemical-reaction-based first generation tunnel block system. Complete development of reports compiling recent domestic and international terrorist events involving person-borne and vehicle-borne improvised explosive device (PBIED & VBIED) events, including location, threat, success or failure factors and overall impact. Continue development of a novel ship-to-shore fuel transport system in an amphibious towable container that mitigates risk to personnel and fuel loss in the event of an attack. Continue development and evaluation of an airborne system that can detect specific infrastructure aspects without requiring line of sight. Continue the test and evaluation of a low-cost compressed air storage system for the rapid evacuation of personnel from confined subterranean spaces, for both training and operational applications. 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. Initiate development of a realistic, modular subterranean training fixture, made of novel materials and configured above ground that shall replicate a communications- and GPS-denied environment. Initiate development of a motorized personnel transporter and a non-motorized material transporter to move personnel or materials through confined spaces over various surfaces (e.g., sand, mud, cement, rock). FY 2020 OCO Plans: Initiate development of a relocatable tower system with additional mast height and updated surveillance and communications technologies capable of transmitting real time imagery and geolocations between Command and Control sites and field operators. FY 2019 to FY 2020 Increase/Decrease Statement: Decrease due to changes in Congressional Add funding.						
Title: SURVEILLANCE, COLLECTION AND OPERATIONS SUPPORT 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. FY 2019 Plans:		9.730	10.526	4.517	7.991	12.508

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C. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Complete Option to add transmit functions and production of 20 additional CALYPSO Transceivers. Complete development of new or improved technologies pertaining to non-standard, secure communications. Complete Phase II development and testing of the classified CattleDog Technical Collection and Surveillance capability. Complete development and delivery of a high-performance noise reduction phased array microphone and speaker TTL software capability. The effort supports the delivery and integration of two systems to support DOD and Law Enforcement. The technologies provide near real-time situational awareness of incoming signals, filtering speakers, messages, languages, and location. Complete development of High Altitude Pseudo Satellite payloads. Complete 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. Complete feasibility assessment of a classified Technical Collection capability. Continue classified project installation support of Social Media base capability. Continue development of a single compact, gimbaled next generation Hyperspectral Imagery (HSI) aerial sensor in both SWIR and LWIR wavebands and provide industry standard data outputs. Continue development of a KA band small form factor electronically steerable array antenna system for maritime and mobile operations. Continue development of an Emergency Notification and Tracking communications capability. Continue development of a classified Cyber Operations capability. Initiate spiral development of the Enhanced CALYPSO RFIC and integrated transceiver devices. Initiate classified feasibility assessment to design and develop a new Cube Satellite Communications System. Initiate classified project to develop a new Personal Electronic Device Secured Note taking applications. Initiate development of a new miniaturized Ultra High Frequency Band antenna or family of antennas. Initiate classified project to develop a specialized antenna system. Initiate classified project to develop wave form identification system. Initiate classified project to develop a Media Exploitation capability. Initiate classified project to develop an Alarm Defeat Capability. Initiate effort to develop a Facial Recognition and Manipulation Capability for Social Media. FY 2020 Base Plans: Complete Classified Social Media Project. Complete development of a KA band small form factor electronically steerable array antenna system for maritime and mobile operations. Complete development of an Emergency Notification and Tracking communications capability. Complete development of a classified Cyber Operations Capability. Continue spiral development of the Enhanced CALYPSO RFIC and integrated transceiver devices. Continue classified feasibility assessment to design and develop a new Cube Satellite Communications System. Continue classified project to develop a new Personal Electronic Device Secured Note taking application. Continue classified project to develop a new Personal Electronic Device Secured Note taking application.						

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C. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Continue development of a new miniaturized Ultra High Frequency Band antenna or family of antennas. Continue development of a new miniaturized Ultra High Frequency Band antenna or family of antennas. Continue classified project to develop a specialized antenna system. Continue classified project to develop wave form identification system. Continue classified project to develop a Media Exploitation capability. Continue classified project to develop a Wireless Alarm Defeat Capability. Continue effort to develop a Facial Recognition and Manipulation Capability for Social Media. Initiate classified Special Communications effort. Initiate classified technical collection effort. Initiate classified technical collection effort. Initiate classified development of a cognitive radio. Initiate classified technical collections and surveillance capability. Initiate classified technical collection and surveillance and counter surveillance capability. Initiate development of a classified special communications capability that integrates advanced computing technologies. Initiate feasibility assessment to advance use of lasers for communication. Initiate development of classified surveillance capability. Initiate development of classified surveillance and technical collection capability. Initiate development of a classified electronic counter surveillance capability. Initiate classified Task Plan to support assessment of High Altitude Reconnaissance Platforms. FY 2020 OCO Plans: Continue development of a single compact, gimbaled next generation Hyperspectral Imagery (HSI) aerial sensor in both SWIR and LWIR wavebands and provide industry standard data outputs. Initiate classified development of a cognitive radio. FY 2019 to FY 2020 Increase/Decrease Statement: Minor changes and increases are reflective of departmental priorities.						
Title: TACTICAL OPERATIONS SUPPORT Description: The Tactical Operations Support subgroup's mission is to execute rapid research and development projects that enhance capabilities of DoD and Interagency special operations tactical teams engaged in finding, fixing, and finishing terrorists. This includes support to state and local law enforcement agencies to combat domestic terrorism. The development focus is enabling small tactical units by providing state of the art overmatch capabilities in: Offensive Systems; Unconventional Warfare, Counter-Insurgency Support; Tactical Communications; Tactical Reconnaissance, Surveillance, and Target Acquisition Systems; Specialized Infiltration, Access and Exfiltration Systems; and Survivability Systems. FY 2019 Plans:		19.356	25.873	5.438	8.620	14.058

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C. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Complete development and delivery of a multispectral augmented visually enhanced reality imaging capability that provides a significant advantage for long-range target acquisition in challenging environments. Complete spiral development of integration of small unmanned aircraft system stabilized gimbal that integrates laser target designation technologies onto current program of record airframes. Complete spiral development to improve form factor, interoperability, and battery life of a state-of-the-art amplified transceiver speaker unit to work with a number of military and commercial radio devices. Complete spiral development of a next generation Lightweight Medium Machine Gun (LWMMG) and polymer .338 Norma Magnum ammunition to give Special Operations Forces a distinct advantage in both the extended and close-in fight and be able to transition rapidly from mounted operations to dismounted operations. Complete development of an Air to Surface Employment Kit (A2SEEK), for the already developed Micro Weather Sensor (MWS), to be packaged into a complete system that will be air dropped out of military aircraft to support operators and C2 elements to receive sensed weather elements and formulate aviation reports in deep battlespace or denied areas. Complete development of an accurized 120mm mortar system with an advanced targeting system for installation and employment on a 5-ton Medium Tactical Vehicle (MTV) capable of lethal target engagement from a short halt out to 7 kilometers. Complete testing and optimization of barrel length, rifling twist rate, and suppression of the .300 Blackout rifle platform in conjunction with an underwater supercavitating ammunition. Complete development of a High Frequency (HF) radio integrated into a cellular phone for use in low-profile operations. Complete development of a new ballistic algorithm, projectile drag coefficient, and weapon system for lethal target engagement beyond 2,500 meters. Complete development of a compact, wide exit pupil direct view optic for use on lightweight medium machine guns to effectively engage targets at the maximum effective range of the weapon system. Complete test and evaluation of an all-in-one wall breaching charge frame capable of breaching heavily reinforced concrete walls in one stage for conventional and Special Operations Forces. Continue development of a man-portable (dismounted/static), on-the-move (vehicle mounted), and kinetic kill anti-drone system kit that is capable of detection, tracking, identification, and defeating a small Unmanned Aircraft System (sUAS). Initiate development of a small unmanned aerial system gunship with a modular kinetic payload for lethal engagements. Initiate development and testing of a thermal camouflage material for soldier uniforms, vehicles, and hide sites. Initiate development of a clip-on in-line mid-wave infrared thermal sight for use on lightweight medium machine guns, sniper rifles, and for counter-UAS missions. Initiate development of a vertical take-off and landing loitering munition for engagement of targets in urban areas and defilade for Special Operations Forces. Initiate development of lightweight ammunition packaging to replace the standard M2A1 ammunition for use in logistical re-supply by conventional and Special Operations Forces. Initiate development of a family of intermediate caliber weapon systems, including ammunition, for use in close quarters combat, designated marksmen, and individual weapon system roles. Initiate test and evaluation of a stabilized weapon mount for						

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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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
employment on ground vehicles, airframes, and maritime platforms. Initiate test and evaluation of a commercially available cluster munition to determine its efficacy in reducing the dud rate to less than one percent. FY 2020 Base Plans: Complete development of a clip-on in-line mid-wave infrared thermal sight for use on lightweight medium machine guns, sniper rifles, and for counter-UAS missions. Complete development of a vertical take-off and landing loitering munition for engagement of targets in urban areas and defilade for Special Operations Forces. Complete development of lightweight ammunition packaging to replace the standard M2A1 ammunition for use in logistical re-supply by conventional and Special Operations Forces. Complete 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 development and testing of a thermal camouflage material for soldier uniforms, vehicles, and hide sites. Complete test and evaluation of a stabilized weapon mount for employment on ground vehicles, airframes, and maritime platforms. Complete test and evaluation of a commercially available cluster munition to determine its efficacy in reducing the dud rate to less than one percent. Continue development of a small unmanned aerial system gunship with a modular kinetic payload for lethal engagements. Continue development of a family of intermediate caliber weapon systems, including ammunition, for use in close quarters combat, designated marksmen, and individual weapon system roles. Initiate development of an advanced weapon sight capable of ranging, tracking, and providing real-time ballistic shooting solutions for individual weapon systems. Initiate development of a low-cost tactical sUAS that complies with current DoD cyber hardening policy. Initiate development of a communications kit optimized for use in subterranean and complex urban terrain. Initiate development of a dual channel near infrared and long wave infrared sight for individual weapon systems. Initiate development of highly accurized ammunition for next generation sniper systems. Initiate development of an electronic warfare kit optimized for use in subterranean and complex urban terrain. Initiate integration of a gimbaled laser target designator on various sUAS platforms for terminal guidance operations. Initiate development of a sense through the wall capability for tactical operators. Initiate development of a rapid, low-collateral damage window breaching mechanism. Initiate development of a remotely controlled identify friend/foe and lighting capability for multipurpose canines. FY 2020 OCO Plans: Initiate development of a low cost tactical sUAS that complies with current DoD cyber hardening policy. Initiate development of a communications kit optimized for use in subterranean and complex urban terrain. Initiate development of a dual channel near infrared and long wave infrared light for individual weapon systems. Initiate development of highly accurized ammunition for next generation sniper systems. Initiate development						

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense				Date: March 2019		
Appropriation/Budget Activity 0400: Research, Development, Test & Evaluation, Defense-Wide I BA 3: Advanced Technology Development (ATD)		R-1 Program Element (Number/Name) PE 0603122D8Z I Combating Terrorism Technology Support				
C. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
of an electronic warfare kit optimized for use in subterranean and complex urban terrain. Initiate integration of a gimbaled laser target designator on various sUAS platforms for terminal guidance operations. Initiate development of a sense through the wall capability for tactical operators. Initiate development of a rapid, low-collateral damage window breaching mechanism. Initiate development of a remotely controlled identify friend/foe and lighting capability for multipurpose canines. Initiate development of a non-emissive wind sensing capability for sniper teams. Initiate development of a next-generation undersea propulsion mechanism for divers. Initiate development of a maritime camouflage system for insertion operations. Initiate development of a system to kinetically engage maritime platforms from rotary wing platforms for vessel stopping. FY 2019 to FY 2020 Increase/Decrease Statement: Decrease due to changes in Congressional Add funding.						
Title: TRAINING TECHNOLOGY DEVELOPMENT Description: The TTD Subgroup’s objective is to provide SOF, DoD, and the interagency with agile, rapid response, R&D capabilities for optimizing performance in the operational environment and increasing readiness for tomorrow’s threats. To meet this objective, the subgroup develops human-centered technologies that are performance outcome focused in the areas of immersive learning technology; human performance tools and techniques; mobile learning solutions; and innovative training and educational concepts. TTD’s capabilities are implemented globally to prepare for critical missions in any operational environment to identify, disrupt, and defeat terrorist threats. FY 2019 Plans: Complete the development and evaluation of an automated capability for the Unites States Marine Corps to immediately diagnose shooter performance thereby enhancing coaches and instructor's capabilities for optimizing individual fundamental shooting skills. Complete the development of interactive instructional videos consisting of human like avatars demonstrating applied Explosive Ordnance Disposal skills for use as instructional aids in the classroom and student independent study. Complete the development and evaluation of a synthetic intelligence, surveillance, and reconnaissance (ISR) system to train Full Motion Video (FMV) ISR operational knowledge, skills, and abilities without incurring the costs of utilizing live ISR platforms. Complete the development of a virtual reality (VR) based training system for Public Safety Bomb Technicians and Military Explosive Ordnance Disposal forward teams to practice sensitive site exploitation skills with realistic lab equipment in simulated field and lab settings. Continue the enhancement of an existing human performance application to incorporate the recording and analysis of mental performance indicators such as stress, motivation, and fatigue thereby providing a common language for instructors, psychologists, and human		5.257	6.050	5.818	1.740	7.558

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense				Date: March 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
performance coaches to understand and make decisions about training. Initiate the development of a program of instruction (POI) and training support package for the operation and maintenance of the electro-drive recoil mortar systems. Initiate the development of an interactive and dynamic Full Motion Video (FMV) Processing Exploitation, and Dissemination (PED) desktop training simulator that trains SOF analysts to SOF-specific FMV PED tactics, techniques, and procedures; methodologies; and product standards. Initiate 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. Initiate the development of an immersive mixed reality (MR) simulator for training specific emergency procedures (EPs) for the MK-16 self-contained diving rig often used for Mine Countermeasures operations. Initiate the development and evaluation 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 adversary's publicly available information (PAI), as well as engaging in large-scale Information Operations (IO) exercises, while mitigating the challenges and risks associated with training on the open, publicly visible Internet.						
FY 2020 Base Plans: Complete the enhancement of an existing human performance application to incorporate the recording and analysis of mental performance indicators such as stress, motivation, and fatigue thereby providing a common language for instructors, psychologists, and human performance coaches to understand and make decisions about training. Complete the development of a program of instruction (POI) and training support package for the operation and maintenance of the electro-drive recoil mortar systems. Complete the development of an interactive and dynamic Full Motion Video (FMV) Processing Exploitation, and Dissemination (PED) desktop training simulator that trains SOF analysts to SOF-specific FMV PED tactics, techniques, and procedures; methodologies; and product standards. 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. 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. Continue the development and evaluation 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 adversary's publicly available information (PAI), as well as engaging in large-scale Information Operations (IO) exercises, while mitigating the challenges and risks associated with training on the open, publicly visible Internet. Initiate the development of photorealistic immersive training environments to replicate high-risk						

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense				Date: March 2019							
Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 3: Advanced Technology Development (ATD)</i>			R-1 Program Element (Number/Name) PE 0603122D8Z I <i>Combating Terrorism Technology Support</i>								
C. Accomplishments/Planned Programs (\$ in Millions)											
			FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total				
<p>scenarios and standardize curriculum for Explosive Ordnance Disposal technicians and other operators. Initiate the development of a wireless system of GPS beacons and tablet-based software program for objectively assessing shooter performance during Close Quarters Combat or house/building clearing operations training. Initiate the development of a program of instruction to teach physical and cognitive enhancement methods and incorporate human performance measurement technologies to evaluate and validate the methods taught. Initiate 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. Initiate the development of a virtual reality training software tool with a wearable ocular display interface that enables students and operators to interface with physical arming and firing features of thousands of user-selected ordnance items.</p> <p><i>FY 2020 OCO Plans:</i> Initiate the development of an AC-130J Virtual Reality Combat Mission Trainer to enable operational crews to engage in mission tasks within a simulated environment that replicates sensory information of real-world mission performance found in joint mission essential task (JMET) environments.</p> <p><i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> Minor changes and increases are reflective of departmental priorities.</p>											
Accomplishments/Planned Programs Subtotals			149.541	171.321	70.517	25.230	95.747				
D. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• 0603121D8Z: <i>SO/LIC Advanced Development</i>	0.000	0.000	5.000	0.000	5.000	5.100	5.202	5.306	5.412	Continuing	Continuing
Remarks N/A											
E. Acquisition Strategy N/A											
F. Performance Metrics N/A											

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	64.500	21.715	24.277	24.970	-	24.970	25.416	25.909	26.406	26.966	Continuing	Continuing
313: Foreign Comparative Testing	64.500	21.715	24.277	24.970	-	24.970	25.416	25.909	26.406	26.966	Continuing	Continuing

A. Mission Description and Budget Item Justification

The Foreign Comparative Testing (FCT) Program increases Joint Force readiness and lethality by providing near-term solutions to existing and future Department of Defense (DoD) capability gaps by leveraging the Research & Development (R&D) investments of allied nations and coalition partners. The Foreign Comparative Testing (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. FCT projects are jointly conducted with the Military Services and USSOCOM. 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 FCT provides. 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 2018 National Defense Strategy. FCT supports the FY2020 Administration R&D Budget Priority of Partnering with Industry by enabling rapid fielding of innovative technologies from the private sector that are easily adaptable to DoD needs. Authorized by Title 10, U.S. Code, Section 2350a (g), the FCT program is managed by the Office of the Under Secretary of Defense for Research and Engineering (OUSD R&E), Comparative Technology Office (CTO).

Measurable Outcomes:

-FCT projects will demonstrate capability objectives within 24-36 months.

-Over its 39 year history, FCT has a transition rate of 58% percent (355 out of 610) for completed projects. Of the 355 projects that tested successful, 278 (78%) resulted in follow on procurements of over \$11.000 billion.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603133D8Z I <i>Foreign Comparative Testing</i>
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B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	24.199	24.532	25.041	-	25.041
Current President's Budget	21.715	24.277	24.970	-	24.970
Total Adjustments	-2.484	-0.255	-0.071	-	-0.071
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.441	-			
• Congressional Reduction	-2.000	-0.200	-	-	-
• FFRDC Reduction	-0.043	-0.055	-	-	-
• Other Program Adjustments	-	-	-0.071	-	-0.071

Change Summary Explanation

Congressional reductions were the result of directed efficiencies

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
313: Foreign Comparative Testing	64.500	21.715	24.277	24.970	-	24.970	25.416	25.909	26.406	26.966	Continuing	Continuing

A. Mission Description and Budget Item Justification

The FCT Program Element funding supports projects that evaluate pre-Engineering and Manufacturing Development (pre-EMD) and proof of principle prototypes derived from innovative allied nation developed technologies to counter emerging threats. Individual projects typically average less than \$1.200 million each and complete within 24-36 months. Projects are proposed by the Military Services and SOCOM 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 selected based on the potential to yield cost, schedule, or performance improvements over the status quo.

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
<div><div>Title: Advanced Torpedo Warheads and Propulsion (Navy)</div><div>Description: Evaluates allied nation torpedo technologies for potential insertion into the US Navy's Lightweight Torpedo (LWT) development program. This effort provides the potential to increase lethality through the use of shaped charged warheads and higher performing propulsion technology. This project began test plan development in 4Q FY 2018. This project continues in FY 2019 with FY 2019 funds.</div><div>FY 2019 Plans: This project continues test planning and preparation in FY 2019 and will receive test articles in 3Q FY 2019. Comparative testing of the torpedoes will start in 4Q FY 2019. This project continues in FY 2020 with FY 2020 funds.</div><div>FY 2020 Plans: Torpedo testing initiated in FY 2019 will continue in FY 2020. Evaluation and closeout reports are to be completed and a procurement decision rendered in 4Q FY 2020. If successful, this technology will transition to the Navy's LWT development program.</div><div>FY 2019 to FY 2020 Increase/Decrease Statement: Funding decreases from FY 2019 to FY 2020 as final testing is completed.</div></div>	0.750	1.200	1.000
<div><div>Title: Cryo-cooler For Distributed Aperture System (Air Force)</div><div>Description: This project combines a new cryo-cooler technology with leading edge infrared sensor technology to increase reliability, extend the life of sensor equipment, and reduce costs. This technology will also decrease cool down time enabling aircraft to meet critical launch timelines. This project initiated test planning in 2Q FY 2018, received test articles in 3Q FY 2018,</div></div>	1.780	-	0.160

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
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 2018	FY 2019	FY 2020
and initiated test article integration in 4Q FY 2018. This project continues in FY 2019 with FY 2018 funds. This project will complete test article integration and initiate reliability testing in 3Q FY 2019 using FY 2018 funding.				
FY 2020 Plans: In FY 2020, a final test report will be produced and provided to the Procurement Decision Authority and a project close out report will be provided to the FCT Program. If successful, this technology will be procured by the Joint Program Office for Avionics, for aircraft integration.				
FY 2019 to FY 2020 Increase/Decrease Statement: Funding increases from FY 2019 to FY 2020 to complete final test reports.				
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. Initiated test planning in 4Q FY 2018. A contract was awarded for test article procurement late in 4Q FY 2018 using FY 2017 funding and therefore no FY 2018 funding was required. This project continues in FY 2019 with FY 2019 funds.		-	0.500	1.000
FY 2019 Plans: Integration planning and test article development will be conducted in FY 2019. This project continues in FY 2020 with FY 2020 funds.				
FY 2020 Plans: Test articles will be received and laboratory testing will commence in 2Q FY 2020. This project will continue in FY 2021 with FY 2020 funding. If successful, the US Navy plans to compete and award an X-band Radar program to develop and produce an advanced sensor for employment in DDG Flight III and other surface combatants.				
FY 2019 to FY 2020 Increase/Decrease Statement: Funding increases from FY 2019 to FY 2020 to support shipboard integration and testing.				
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. If successful, initial transition would consist of a limited procurement with user evaluation by operational units prior to fielding with		0.150	0.650	0.800

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
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 2018	FY 2019	FY 2020
Ground Combat Elements. Contract preparation was completed in 4Q FY 2018. This project continues in FY 2019 with FY 2019 funds. FY 2019 Plans: Test articles are scheduled for delivery in 2Q FY 2019. Live fire testing will be initiated in 3Q FY 2019. This project continues in FY 2020 with FY 2020 funds. FY 2020 Plans: In 2Q FY 2020, Phase II Live Fire testing will be completed. In 3Q FY 2020, an assessment report will be completed. A transition decision and close-out report will be completed in 4Q FY 2020. FY 2019 to FY 2020 Increase/Decrease Statement: Funding increases from FY 2019 to FY 2020 to support major test events.				
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. If successful, the technology will transition to Marine Corps Networks on the Move program of record. Contract preparation was completed in 4Q FY 2018. This project continues in FY 2019 with FY 2019 funds. FY 2019 Plans: Test articles are scheduled for delivery in 2Q FY 2019. Testing will be initiated in 3Q FY 2019. This project continues in FY 2020 with FY 2020 funds. FY 2020 Plans: Evaluation testing initiated in FY 2019 will continue in FY 2020. Evaluation and closeout reports are to be completed and a transition decision rendered in 4Q FY 2020. FY 2019 to FY 2020 Increase/Decrease Statement: Funding decreases from FY 2019 to FY 2020 as final testing is completed.		0.235	0.585	0.250
Title: Autonomous Anti-Submarine Warfare (ASW) Training Target (Navy) Description: Demonstrate the capabilities of an off-the-shelf autonomous underwater vehicle for ASW training. This system accurately replicates the acoustic signature of threat submarines and provides a significant enhancement in training effectiveness over the decades-old technology currently in use. Phase 1 testing conducted at the Atlantic Undersea Test & Evaluation Center during 4Q FY 2018. This project continues in FY 2019 with FY 2019 funds.		0.874	0.276	-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
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 2018	FY 2019	FY 2020
FY 2019 Plans: Conduct phase 2 delta testing and evaluation in 2Q FY 2019. Complete final test and closeout report in 4Q FY 2019. If successful, the Navy anticipates purchasing ten ASW Training Targets under an Abbreviated Acquisition Program for approximately \$30M.				
FY 2019 to FY 2020 Increase/Decrease Statement: Funding drops to zero in FY 2020 due to project completion.				
Title: High Power Radio Frequency (HPRF) for Counter Unmanned Aerial Systems (CUAS) (Navy/USMC) Description: This project integrates and tests HPRF directed energy source components with various off-the-shelf sensor technologies to provide a complete CUAS prototype system that provides the capability to detect, track, identify, engage and defeat low and slow UAS. Enhances DoD capabilities in Directed Energy focus area. In 3Q FY 2018, an enclosure was built to test the system against a UAS. A directed energy system from the UK has been purchased with delivery scheduled for 4Q FY 2018. This project continues in FY 2019 with FY 2019 funds.		0.620	0.784	-
FY 2019 Plans: Perform testing of directed energy source against UAS using beam steering in 2Q FY 2019. Writing technical report of results in 4Q FY 2019. If successful, this will transition into a Program of Record for the Marine Corps.				
FY 2019 to FY 2020 Increase/Decrease Statement: Funding drops to zero in FY 2020 due to project completion.				
Title: Hybrid Vertical Take-off and Landing (VTOL)/Fixed Wing UAS (Navy) Description: Most UAVs in the Navy inventory are large fixed-wing types which require a significant amount of runway and remote crew coordination for take-off or smaller quadcopters which lack the endurance and/or payload capacity of larger UAVs. This project will comparatively test off-the-shelf hybrid UAS equipped with rotary engines capable of vertical takeoff and landing and fixed wing flight for increased endurance and range. An analysis of alternatives was accomplished in 3Q FY 2018. Contract preparation for test article procurement was initiated in 4Q FY 2018. This project continues in FY 2019 with FY 2019 funds.		0.510	0.610	-
FY 2019 Plans: Receive test articles in 2Q FY 2019. Conduct comparative testing in 3-4Q FY 2019. If successful, this will transition into a Program of Record for the Marine Corps and the Navy.				
FY 2019 to FY 2020 Increase/Decrease Statement: Funding drops to zero in FY 2020 due to project completion.				
Title: Maritime Precision Engagement for Naval Special Warfare (United States Special Operations Command (USSOCOM))		1.500	0.500	-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603133D8Z / <i>Foreign Comparative Testing</i>	Project (Number/Name) 313 / <i>Foreign Comparative Testing</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>Description: This project will integrate a non-line-of-sight (NLOS) missile system into a representative maritime test asset to test the performance and lethality of over-the-horizon precision strike capability. A NLOS missile system will provide Naval Special Warfare combatant craft with an organic capability to surgically engage high-value targets at range when Service-Common munitions and Close Air Support cannot be employed. This project initiated test planning in FY 2018. This project continues in FY 2019 with FY 2019 funds.</p> <p>FY 2019 Plans: This project will receive test articles in 1Q FY 2019 and conduct phase 1 static target testing during 2Q FY 2019, phase 2 dynamic target testing during 2-3Q FY 2019, and complete final test and closeout reports in 4Q FY 2019. If successful, this technology will transition to SOCOM's Program Executive Office Maritime for follow-on delta qualification testing and fielding.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding drops to zero in FY 2020 due to project completion.</p>			
<p>Title: More Reliable, Longer Endurance, More Power Unmanned Aerial Systems (UAS) (Army)</p> <p>Description: This project will comparatively test 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. The objective is to evaluate the performance of the Hunter and Trident 100TD2 engines using low quality fuels. Hunter UAS experienced significant performance decrease when low quality fuels are used. This project received phase 1 test articles in 1Q FY 2018, initiated phase 1 legacy engine baseline lab testing in 2Q FY 2018. This project continues in FY 2019 with FY 2019 funds.</p> <p>FY 2019 Plans: This project will complete phase 1 baseline lab testing and receive phase 2 test articles in 1Q FY 2019, conduct phase 2 Trident 100TD2 lab testing from 2-4Q FY 2019, and complete final test and closeout reports in 4Q FY 2020. If successful, the Army will pursue a flight demonstration prior to adoption into the Army's UAS Programs of Record.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding drops to zero in FY 2020 due to project completion.</p>		0.582	0.405
<p>Title: Pilot Physiology Based Autonomous Life Support System (Air Force)</p> <p>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</p>		1.030	0.550

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603133D8Z / <i>Foreign Comparative Testing</i>	Project (Number/Name) 313 / <i>Foreign Comparative Testing</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>events currently experienced by pilots, improving flight safety and aircraft availability. Supports DoD's Artificial Intelligence/ Machine Learning focus area. This project initiated test planning and test article contracts in 4Q FY 2018. This project continues in FY 2019 with FY 2019 funds.</p> <p>FY 2019 Plans: This project will receive PBAM test articles and will conduct centrifuge/altitude testing in 1Q FY 2019. This project will receive PPMAWS test articles in 2Q FY 2019 and conduct software/hardware integration in 3-4Q FY 2019. Pre-flight test data analysis and test reporting will occur during 2-4Q FY 2019. Complete PBAM flight test during 1-2Q FY 2020 using FY 2019 funds. Complete PPMAWS centrifuge and altitude testing in 2Q FY 2020 using FY 2019 funds. Complete PPMAWS flight test data packet in 3Q FY 2020 using FY 2019 funds. Complete final test and project closeout reports in 4Q FY 2020 using FY 2019 funds. If successful, PPMAWS is to be part of an upgrade to the Digital Joint Mounted Helmet Cuing System (DJHMCS) for fourth and fifth generation fighter aircraft. If successful, PBAM could be directly procured.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding drops to zero in FY 2020 due to project completion.</p>			
<p>Title: Three Dimensional (3D) Mapping at the Edge (USSOCOM)</p> <p>Description: Leverages state of the art artificial intelligence techniques to extract 3D surface models from multiple source data and load products onto forward deployed handheld devices in real-time. This project will deliver an advanced capability for the management, production and dissemination of geospatial mission data, including 3D elevation data, in an open standards-based format that supports operations in dismounted and/or disconnected environments using mobile devices. Enhances the DoD's capabilities in the Artificial Intelligence/Machine Learning focus area. This project leverages previous FCT investments that fielded a rapid 3D mapping capability and expanded to investigate delivery to mobile devices in austere locations. This project initiated test planning in 4Q FY 2018. This project continues in FY 2019 with FY 2019 funds.</p> <p>FY 2019 Plans: This project will conduct software design and integration in 2Q FY 2019 and conduct comparative testing during 3-4Q FY 2019. If successful, the technology will transition to USSOCOM's Program Executive Office for Special Reconnaissance, Surveillance and Exploitation as well as the National Geospatial-Intelligence Agency for follow-on operational testing and fielding.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding drops to zero in FY 2020 due to project completion.</p>		0.621	0.304
<p>Title: Rifle Accessory Control Unit</p> <p>Description: This project tests a rifle mounted device capable of controlling various weapon accessories or radios. This device enables Marines to maintain situational awareness without taking their hand off the weapon. If successful, this technology will</p>		0.357	0.326

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>be transitioned to the Program Manager for Marine Expeditionary Rifle Squad for follow on procurement and fielding. Phase I Squad Usability tests were completed in 1Q FY 2018. Environmental/shock testing was conducted in 2-3Q FY 2018. Phase II Platoon Usability tests were conducted in 3-4Q FY 2018. This project continues in FY 2019 with FY 2019 funds. If successful, this technology will be transitioned to the Program Manager for Marine Expeditionary Rifle Squad for follow on procurement and fielding.</p> <p>FY 2019 Plans: Phase III RACU/powered vest prototype integration and testing will be conducted during 1-3Q FY 2019. Final test and closeout reports will be completed in 4Q FY 2019.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding drops to zero in FY 2020 due to project completion.</p>			
<p>Title: Hostile Fire & PreShot Detection for Vehicle Protection Systems (Army)</p> <p>Description: FY 2019 New Start - 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. Comparative evaluation data will be provided to Program Manager Vehicle Protection Systems to support follow-on procurement.</p> <p>FY 2019 Plans: Test planning initiated in 1Q FY 2019. Phase I hostile fire test articles will be received in 2Q FY 2019. Installation and test of hostile fire systems will commence in 3Q FY 2019. This project continues in FY 2020 with FY 2020 funds.</p> <p>FY 2020 Plans: Phase II Pre-shot detection systems will be demonstrated in 1Q FY 2020. Characterization testing will take place in 3Q FY 2020. Test report will be completed in 4Q FY 2020.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding increases in FY 2020 to support major test events.</p>		-	0.700
<p>Title: Active Expendable Decoys (Air Force)</p> <p>Description: FY 2019 New Start – 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.</p>		-	1.000
			2.000

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>FY 2019 Plans: Test planning initiated in 1Q FY 2019. Contract preparation and award will take place in 2Q FY 2019. Test articles will be received in multiple increments starting in 3Q FY 2019. Phase I Characterization testing will take place in 4Q FY 2019. This project continues in FY 2020 with FY 2020 funds.</p> <p>FY 2020 Plans: Phase II platform-specific testing will be conducted in FY 2020. This project continues in FY 2021 with FY 2021 funds.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding increases in FY 2020 to support platform testing.</p>			
<p>Title: Event-Based Sensing for Space & Directed Energy Applications (Air Force)</p> <p>Description: FY 2019 New Start - This project comparatively tests neuromorphic imaging technology and algorithms. This technology enhances daytime ground/space-based space situational awareness and directed energy test and evaluation. If successful, the resulting prototype will enhance ground-based space situational awareness and the technology will be inserted into further space-based situational awareness technology development.</p> <p>FY 2019 Plans: Test article cameras are to be received in 3Q FY 2019. Design for integration of camera into sensor applications is to be completed in 4Q FY 2019. This project continues in FY 2020 with FY 2020 funds.</p> <p>FY 2020 Plans: Application-specific testing will occur throughout FY 2020. Tests are to be completed by 4Q FY 2020 with a closeout report.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding decreases in FY 2020 due to project completion.</p>		-	0.500
<p>Title: Improved Amphibious Track (Navy)</p> <p>Description: FY 2019 New Start – 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.</p> <p>FY 2019 Plans:</p>		-	0.800
			1.600

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
Initiated test planning in 1Q FY 2019. Contract preparation and award will take place in 2Q FY 2019. Test articles will be received in 3Q FY 2019. Phase I characterization testing will commence in 4Q FY 2019. This project continues in FY 2020 with FY 2020 funds. FY 2020 Plans: Complete Phase I testing 1Q FY 2020. Conduct Phase II noise and obstacle testing in 2Q FY 2020. Phase III durability testing will be completed by 3Q FY 2020. The project is expected to complete in 4Q FY 2020. FY 2019 to FY 2020 Increase/Decrease Statement: Funding increases in FY 2020 to support major test events.				
Title: Synthetic Aperture Sonar for Mine Countermeasures Unmanned Underwater Vehicles (UUVs) (Navy) Description: FY 2019 New Start - This project tests a Synthetic Aperture Sonar payload with on-board automatic target recognition algorithms for Mine Countermeasure UUVs to increase detection range and resolution. This technology reduces the time required for mine countermeasure missions and post mission analysis. If successful, the technology will transition to Program Manager Naval Explosive Ordnance Disposal for inclusion on the Mk 18 UUV. FY 2019 Plans: Contract preparation and award will take place in 2Q FY 2019 with test articles received in 4Q FY 2019. Phase I test article integration will occur in 4Q FY 2019. This project continues in FY 2020 with FY 2020 funds. FY 2020 Plans: Phase 2 engineering trials will take place throughout FY 2020. Final test and closeout reports will complete in 4Q FY 2020. FY 2019 to FY 2020 Increase/Decrease Statement: Funding decreases from FY 2019 to FY 2020 as final testing is completed.		-	0.860	0.220
Title: Low Cost Innovative Projects (Projects Less Than One Million Dollars Each): Description: OSD CTO selected multiple low cost projects in the areas of Force Protection, Force Support, Anti-Access/Area Denial, Robotics and Autonomous Systems, Interoperability and Countering Unmanned Systems. These projects were selected to deliver proof of principle prototypes for evaluation, assessment, and Service adoption within 24 to 36 months. -Insensitive Munitions Fuze for the M67 Fragmentation Hand Grenade (Army): Comparatively tests off-the-shelf hand grenade fuzes to provide increased safety to the soldier while maintaining lethality for the widely used M67 fragmentation hand grenade. The M67 has been in use since the 1960's and does not meet current Insensitive Munitions safety standards. If successful, Army Program Executive Office Ammunition expects to acquire and field by FY 2023. Received technical data of candidate fuzes in 3Q FY 2018. Initiated test planning in 4Q FY 2018. This project continues in FY 2019 with FY 2019 funds.		8.633	7.319	2.819

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>-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 2 for insertion into the FFG(X) and CVN I-Stalker programs. Contract preparation was completed in 4Q FY 2018. This project continues in FY 2019 with FY 2019 funds.</p> <p>-105MM Family of Multi-Purpose Munitions (Army): This project evaluates advanced munitions for the Army's next-generation Mobile Protected Firepower platform. This technology provides selectable munitions capable of defeating dismounts hiding behind walls and lightly armored targets. If successful, the Army will pursue delta qualification testing prior to fielding. This project initiated test planning in 3Q FY 2018. This project continues in FY 2019 with FY 2019 funds.</p> <p>-Accurate Tracking & Unmanned Underwater Vehicle Navigation (Navy): This project tests sensors that enable the accurate real-time tracking of unmanned underwater systems without the need for a high-cost Inertial Navigation Systems. Current unmanned underwater vehicles use dead reckoning from a single GPS fix obtained at the start of the mission prior to submerging. If new technology can be shown to close capability gaps in current systems then transition strategies will be considered for both the UUV and ROV programs. In 4Q FY 2018, test articles were procured. This project continues in FY 2019 with FY 2019 funds.</p> <p>-Aerostable Penetrator (Army): Evaluates a foreign off-the-shelf 2.75 inch rocket motor integrated with a prototype U.S. developed flachette warhead to optimize lethality against light armor targets dispersed over an area. This project will demonstrate an affordable replacement solution for Cluster Munitions. If successful, this capability is anticipated to transition to the Army's Joint Attack Munition Systems Program Office. Received test articles in 2Q FY 2018 and initiated phase 1 baseline warhead testing in 3Q FY 2018. This project continues in FY 2019 with FY 2019 funds.</p> <p>-Aluminum Foam Blast Protection (Army): Evaluates a lightweight blast protection material for use in the storage and transportation of volatile munitions to increase safety and reduce costs. The material properties will be determined for applicability to various defense applications. If successful, the Army will evaluate the Insensitive Munitions characteristics of a packaging solution for the XM1128 rocket assisted 155mm munition. This project initiated test planning in 3Q FY 2018, received initial test articles and initiated phase 1 material testing in 4Q FY 2018. This project continues in FY 2019 with FY 2018 funds. This project will complete phase 1 testing in 2Q FY 2019, conduct phase 2 munitions packaging prototype evaluation in 3Q FY 2019, and complete final test and closeout reports in 4Q FY 2019 using FY18 funding.</p> <p>-Autonomous Aircraft Material Maintenance (Navy): Test 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. In 4Q FY 2018, conducted a repair demonstration on a V-22 tilt-rotor aircraft and H-1helicopter gearbox. This project continues in FY 2019 with FY 2019 funds.</p> <p>-Diagnostics/Prognostics Test for Traumatic Brain Injury (TBI) (USSOCOM): This project will conduct clinical studies to provide an assessment of the effectiveness of using a panel of specific micro ribonucleic acid (miRNA) biomarkers to objectively detect a traumatic brain injury. The ability to objectively diagnose a TBI within an acute time period (<15 min) allows medical providers to properly asses, evacuate, or return to duty military personnel instead of unnecessary prolonged observation or evacuation</p>			

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>degrading unit readiness. If successful, the miRNA blood based biomarker panel would be incorporated as a diagnostic aid at military treatment facilities. Through the development of a portable diagnostic system (PDS), the Diagnostic/Prognostic Test for TBI will be incorporated into the Tactical Combat Casualty Care Set and Program of Record. This project initiated test planning in 2Q FY 2018, received test articles in 4Q FY 2018, and initiated phase 1 west coast study. This project continues in FY 2019 with FY 2019 funds.</p> <p>-Joint Acquisition Counter Electronics Evaluation (Air Force): This project tests a high power electromagnetic (HPEM) device for potential use in electronic warfare (EW) and counter-unmanned aerial systems (UAS) weapon systems. Performance will be tested against company's claims of power density improvement, power consumption, and employment as an HPEM for EW and counter-UAS applications. HPEM provides an option against counter-UAS swarms and counter electronics missions with functional non-kinetic kill against restricted targets and eliminates collateral damage. Enhances DoD capabilities in Directed Energy focus area. If successful, the technology will transition to the Counter-electronics High Power Microwave Advanced Missile Project in support of the U.S. Air Force Pacific Command (PACAF), U.S. Pacific Command (USPACOM), and Air Force Global Strike Command for precision strike missions. Additional counter-UAS applications for base defense will be explored. This project initiated test planning in 3Q FY 2018. This project continues in FY 2019 with FY 2019 funds.</p> <p>-Multi-Agent Identification Kit and Equipment (MIKE) Butt-pack (Army): Tests an off-the-shelf colorimetric chemical detection system currently in use with NATO assembled into a small, lightweight packaging configuration for U.S. military use. Enhances interoperability between U.S. and NATO forces and reduces resupply requirements, life cycle and procurement costs. If successful, the technology will be available for immediate purchase by Special Operations units and will be pursued for acquisition by the Army through the Guardian Joint Program Management Office. This project initiated test planning in 3Q FY 2018. This project continues in FY 2019 with FY 2019 funds.</p> <p>-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 symbology instead of colors enabling safer night landing operations. If successful, this project will transition into a Program of Record under Naval Air Systems Command, PMA 251. Contract preparation was completed in 3Q FY 2018. This project continues in FY 2019 with FY 2019 funds.</p> <p>-Quantum Communication, Cryptography, and Networking for Secure Satellite Communications (Air Force): This project evaluates a Quantum Key Distribution System (QKDS) for application to high priority encryption requirements. QKDS enables secure encrypted communication without the need to pre-generate, store, and secure large numbers of encryption keys. Quantum cryptography technology promises secure encryption, while making network intrusion impossible without detection. Enhanced DoD capabilities in the Quantum science focus area. If successful, the technology will transition to the Air Force Space and Missile Systems Center (SMC) and the Air Force Global Strike Command for satellite payload and ground station applications. This project initiated test planning in 2Q FY 2018 and initiated phase 1 laboratory testing In 4Q FY 2018. This effort continues in FY 2019 with FY 2019 funds.</p> <p>-Reserve Battery for Munitions (Army): Comparative test of 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</p>			

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B. Accomplishments/Planned Programs (\$ in Millions)			FY 2018	FY 2019	FY 2020
<p>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 will complete phase 1 laboratory testing in 3Q FY 2018 and initiate phase 2 live fire testing in 4Q FY 2018. This effort continues in FY 2019 with FY 2019 funds.</p> <p>-Tactical Debriefing System (TADS) (Navy): This project evaluates a mission and military exercise debriefing tool currently in use with the Finnish Air Force to increase the quality of and reduce the time required to generate after action reviews. The system will be modified to support Electronic Warfare debriefing, a capability that does not currently exist. If successful, this technology will transition to the EA-18G and future naval aircraft mission debriefing systems. Test planning and contract preparation was initiated in 4Q FY 2018. This project continues in FY 2019 with FY 2019 funds.</p> <p>-Advanced Energy Storage and Power Batteries (Navy/USMC): Tests advanced lithium-ion batteries and new cell chemistries for military vehicle applications that will, at a minimum, double energy density. If successful, will allow one-for-two replacement of existing batteries, reducing logistics burden by 50 percent and new battery cell chemistries will be incorporated into existing US supply chain in 6T batteries for military vehicles and ships. Cycle life and low temperature performance testing were completed in 4Q FY 2018. Rate capability and safety testing to be conducted in 2Q FY 2019 using FY 2018 funds. Final test and closeout reports will be completed in 3Q 2019 using FY 2018 funds.</p> <p>-Aerial Ground Mapping for Characterizing Landing Zones (Air Force); Test airborne electromagnetic ground survey techniques currently used in commercial applications for characterizing landing zones for military aircraft. This technology will replace the current approach of inserting manned teams on the ground to perform the manually intensive, time consuming task of characterizing potential landing zones, often in hostile environments. If successful, the technology will transition to the Army Corps of Engineers, Engineer Research and Development Center to conduct follow-on operational testing prior to fielding. This project conducted baseline testing during 1-3Q FY 2018 and completed phase 1 test report in 4Q FY 2018. This project will conduct phase 2 initial system testing during 1-3Q FY 2019 and will complete phase 2 test reports in 4Q FY 2019 with FY 2018 funds.</p> <p>-Autogated White Phosphor Image Intensifying Tubes (USSOCOM): Tests auto-gated white phosphor image intensifier tubes integrated into existing night vision systems to enable greater detection, recognition, and identification ranges for head mounted goggles, hand held surveillance devices, and weapon mounted sights. If successful, the technology will transition to USSOCOM's Program Executive Office Special Operations Forces Warrior for integration into future Binocular Night Vision Device purchases. This project received test articles in 2Q FY 2018, conducted integration and testing in 2-3Q FY 2018, and user demonstrations in 4Q FY 2018. This project will complete final test and closeout reports in 1Q FY 2019 using FY 2018 funds.</p> <p>-Compact Long Range Observation System (USSOCOM): This project evaluates a lightweight, low-power, hand-held precision targeting device to enhance target observation, recognition, and identification of targets during day and night operations at long range. The device features new high operating temperature, mid-wave infrared multispectral technology and will be modified to incorporate U.S. Global Positioning System sensors for evaluation. If successful, the technology will transition to USSOCOM's Program Executive Office Special Operations Forces Warrior. This project received test articles in 2Q FY 2018, conducted integration and testing in 2-3Q FY 2018, and user demonstrations in 4Q FY 2018. This project will complete final test and closeout reports in 1Q FY 2019 using FY 2018 Funds.</p>					

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>-Cruise Missile Gas Turbine Engine (Navy): Tests an off-the-shelf, multi-fuel turbine engine currently in use in various foreign missile systems to provide up to a 200 percent performance increase for legacy US Navy missile systems. If successful, this will transition to the Harpoon Block 2+ missile. In 2Q FY 2018, phase 1 Size, Weight, and Power requirements testing was completed. In 4Q FY 2018, Phase 2 fuel efficiency testing was completed. In 1Q FY 2019, flight testing on a missile is to be completed using FY 2018 funds. Final test and closeout reports to complete in 3Q FY 2019 using FY 2018 funds.</p> <p>-Efficient Turbocharged Internal Combustion Engine for UAS Application (Air Force): This project tests a commercially available aircraft engine to enhance the Long Endurance Aerial Platform (LEAP) UAS to meet increased altitude mission requirements. If successful, the technology will be procured for the LEAP program by US Special Forces Command and the Under Secretary of Defense for Intelligence. This project initiated test planning in 2Q FY 2018 and conducted lab testing in 3-4Q FY 2018. This project will complete final test and closeout reports in 1Q FY 2019 using FY2018 funds.</p> <p>-Enhanced Shipboard Navigation Capability (Navy); This project will evaluate the performance of a multi-constellation Global Navigation Satellite System receiver for US Naval surface ship and airborne applications to provide an additional navigation source in addition to GPS positioning and time solutions. If successful, the new sensor input will be transitioned in the PMW/A 170 GPTNS Program of Record. In 2Q FY 2018, receiver lab testing was completed. In 4Q FY 2018, the receivers were demonstrated during Trident Warrior 2018. Final test and closeout reports will be completed in 1Q FY 2019 with FY 2018 funds.</p> <p>-Fast In-Shore Attack Craft (FIAC) Asymmetric Force Engagement (Navy): This project evaluates the capabilities of a 2.75 inch "fire and forget" imaging infrared rocket versus existing laser guided rocket capabilities against FIAC swarms. If successful, the technology will be transitioned to the Office of Naval Research for additional evaluation and integration into defensive systems. Contract preparation was completed in 4Q FY 2018. Characterization and live-fire testing will be conducted in FY 2019 with FY 2018 funds.</p> <p>-Gallium Nitride (GaN) Amplifier Study of Space Environment Radiation Tolerance (Air Force): Comparatively tests foreign and domestic GaN technology in simulated space radiation environments. GaN offers 5 to 10 times performance improvement over legacy technology. Project success would result in more resilient satellite payloads that are able to survive in the harsh space radiation environment. Additionally, more efficient amplifiers could lead to reduced payload size, increased performance, and reduced procurement costs. Enhances DoD capabilities in the Space Preeminence focus area. If successful, the technology will transition to the Space and Missile Systems Center Global Positioning System Program Office for follow-on operational evaluation on the Navigation and Timing Satellite 3 (NTS-3) flight experiment. Test articles were received in 1Q FY 2018 and a test plan was developed. Concurrent phase 1 benchmark characterization testing and phase 2 radiation effects testing was initiated in 2Q FY 2018. Testing will be completed in 3Q FY 2019 and final test and closeout reports will be completed in FY 2019 with FY 2018 funds.</p> <p>-Gimballed Laser Target Designator (Navy): Tests a miniature 3-axis stabilized electro-optic/infrared turret payload with integrated laser designator on a Group 1 Puma UAS. If successful, Navy PMA-263 will procure additional Gimballed Laser Target Designators through the Combatting Terrorism Technical Support Office's Group 1 UAS Program of Record. Testing was</p>			

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>accomplished on a surrogate UAS at the Naval Air Systems Command Laser Range in 4Q FY 2018. Final test and closeout reports will be completed in 1Q FY 2019 with FY 2018 funds.</p> <p>-HALO Integration with Common Remotely Operated Weapon System (CROWS) (Army): The CROWS provides the capability to locate and attack targets while gunners remain under armor. The HALO system is an add-on image processor that enhances existing camera streams to allow for continuous standard and Infrared (IR) image "fusion" and a significant reduction in motion blur for the CROWS. The CROWS equipped with a HALO system will increase lethality and force protection by greatly improving image clarity and target recognition capability; and increase surveillance capability in a degraded visual environment. If successful, this capability is anticipated to transition to the CROWS Program of Record for the Army. This project initiated data characterization in 4Q FY 2018. This project continues in FY 2019 with FY 2019 funds.</p> <p>-H-1 Crash-Resistant, Ballistic-Tolerant, Fuel Cell Qualification (Navy): This project is testing a crash resistant fuel tank technology currently used in foreign military aircraft. The design of the platform specific representative prototype fuel cell was approved in 2Q FY 2018. Full scale testing was performed in 4Q FY 2018. If successful, the technology will transition to the Navy's H-1 Program Office for follow-on procurement and fielding. Due to Berry Amendment restrictions, the company will likely be required to partner with a U.S. company for production. Final test and closeout reports will be completed in 1Q FY 2019 with FY 2018 funds.</p> <p>-Compact High-Power Radio Frequency Technology for Vehicle & Vessel Stopping (Navy/USMC); This project tests a prototype non-lethal system capable of stopping vehicles and vessels using state of the art foreign microwave components designed for commercial use in medical imaging systems. Enhances the DoD capabilities in the directed energy focus area. In 3Q FY 2018, received test articles. In 4Q FY 2018, radio frequency characterization testing was completed. Developmental testing will be completed in Q1 FY2019 and final test and closeout reports will be completed in Q2 FY2019 with FY2018 funding.</p> <p>-Soldier Power with Inductive Recharge & Intelligent Textiles (SPIRIT) + Ultra Combat Connect (Army): This project comparatively tests wire-free data and power conductive textile and inductive recharge technologies integrated into soldier worn Modular Lightweight Load-carrying Equipment. This technology eliminates cumbersome external cables which reduces weight and provides for a wireless recharge capability. Phase I testing was completed in FY 2018. Complete Phase II lab testing in 2Q FY 2019 with FY 2018 funding. Complete Phase III field assessment in 3Q FY 2019 with FY 2019 funding. Final test and closeout reports are expected in 4Q FY 2019 with FY 2018 Funding.</p> <p>-Falcon Chemical Agent Sensor (Army): This project tests a lightweight standoff chemical agent detector with an advanced tunable infrared laser. This technology enables the identification and localization of chemical plume threats with higher sensitivity than currently deployed technology. Testing completed in FY 2018. Final test and closeout reports are expected in 1Q FY 2019 with FY 2018 funding.</p> <p>-Smartshooter Evaluation (Army): 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. This project initiated test planning in 4Q FY 2018. This project continues in FY 2019 with FY 2019 funds.</p>			

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B. Accomplishments/Planned Programs (\$ in Millions)			FY 2018	FY 2019	FY 2020
<p>-Transparent Ceramic Armor (Army): This project evaluates armor technology that is fifty percent lighter and thinner than existing glass-based systems for application on rotary wing and other military platforms. This technology provides a cost effective solution versus competing products. If successful, the technology will be incorporated into the CH-47 Multi-Impact Transparent Armor System program of record. Initial test planning was conducted in 4Q FY 2018. This project continues in FY 2019 with FY 2019 funds.</p> <p>-Low-Cost Autonomous Target Classification (L-CATC) (Navy): This project will conduct 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. Testing completed in FY 2018. Final test and closeout reports are expected in 1Q FY 2019 using FY 2018 funding.</p> <p>FY 2019 Plans:</p> <p>-Insensitive Munitions Fuze for the M67 Fragmentation Hand Grenade (Army): Conduct x-ray samples and chemical analysis in 1Q FY 2019. Conduct Insensitive Munitions tests in 2-4Q FY 2019. This project continues in FY 2020 with FY 2020 funds.</p> <p>-Panoramic Infrared Sensor Test (Navy): Test articles will be received in 3Q FY 2019. Phase 1 comparative pier-side testing will be initiated in 4Q FY 2019 and will result in down-select to the most capable systems. This project continues in FY 2020 with FY 2020 funds.</p> <p>-Autonomous Aircraft Material Maintenance (Navy): Complete testing in 1Q FY 2019. Complete final test and closeout reports in 3Q FY 2019.</p> <p>-105MM Family of Multi-Purpose Munitions (Army): Down select to occur in 1Q FY 2019. This project will accept delivery of Phase 1 anti-personnel area munition test articles in 3Q FY 2019 and will commence phase 1 testing in 4Q FY 2019. This project is scheduled to complete in FY 2020 with FY 2019 funds. Phase 2 high explosive test articles received in 2Q FY 2020. Phase 2 testing to occur in 3Q FY 2020 using FY 2019 funding. This project will complete with final test and closeout report in 4Q FY 2020 using FY 2019 funding.</p> <p>-Accurate Tracking & Unmanned Underwater Vehicle Navigation (Navy): Phase 1 laboratory testing of the system will be completed in 1Q FY 2019. Phase 2 platform integration is to be completed in 2Q FY 2019. Phase 3 operational demonstration of testing initiates in 3Q FY 2019. This project will continue in FY 2020 with FY 2019 funds. Phase 3 testing completes in 1Q FY 2020 using FY 2019 funding. Final test and closeout report will be submitted in 2Q FY 2020 using FY2019 funding.</p> <p>-Aerostable Penetrator (Army): This project will complete phase 1 testing in 1Q FY 2019, phase 2 prototype system testing in 2Q FY 2019, test reports in 3Q FY 2019, and final project closeout report in 4Q FY 2019.</p> <p>-Diagnostics/Prognostics Test for Traumatic Brain Injury (TBI) (Army): This project will complete phase 1 study in 1Q FY 2019. Initiate phase 2 east coast study in 2Q FY 2019. This project continues in FY 2020 with FY 2019 funds. Complete Phase 2 in 3Q FY 2020 using FY 2019 funding. Complete final test and closeout reports in 4Q FY 2020 using FY 2019 funding.</p> <p>-Joint Acquisition Counter Electronics Evaluation (Air Force): This project will conduct phase 1 testing for system efficiency, survivability, and effectiveness against simulated targets in an anechoic chamber in 1-3Q FY 2019. This project will initiate phase</p>					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603133D8Z / <i>Foreign Comparative Testing</i>	Project (Number/Name) 313 / <i>Foreign Comparative Testing</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>2 wide area testing in 3Q FY 2019. This project will complete phase 2 testing in 1Q FY 2020 using FY 2019 funds. Phase 3 Operational Testing is planned for 2-4Q FY 2020 using FY 2019 funds.</p> <p>-Multi-Agent Identification Kit and Equipment (MIKE) Butt-pack (Army): This project will receive test articles in 1Q FY 2019, conduct prototype integration and lab testing in 2Q FY 2019, conduct field evaluation in 3Q FY 2019, and complete final test and closeout reports in 4Q FY 2019.</p> <p>-Night Vision Device Capable Deck Status Display (Navy): Test articles are to be received in 1Q FY 2019. Functional testing will be done in 2Q FY 2019. Environmental testing will be done in 4Q FY 2019. Project continues in FY 2020 using FY 2019 funding. Continue electro-magnetic and environmental testing in FY 2020 using FY 2019 funds. Also completing final evaluation reports with a recommendation in FY 2020 using FY 2019 funds.</p> <p>-Quantum Communication, Cryptography, and Networking for Secure Satellite Communications (Air Force): This project will complete phase 1 testing in 2Q FY 2019 and conduct phase 2 field testing in 3-4Q FY 2019. Project will continue in FY 2020 using FY 2019 funding. Phase 3 operational testing and final test and closeout reports are planned for FY 2020 using FY 2019 funds.</p> <p>-Reserve Battery for Munitions (Army): Phase 2 testing live fire/actual ballistic testing in the end item or surrogate carrier will be completed in FY 2019.</p> <p>-Tactical Debriefing System (TADS) (Navy): Phase 1 baseline comparison testing will be conducted in 1-2Q FY 2019. Phase 2 data link testing will be completed in 3Q FY 2019. Electronic Warfare data integration will commence in 4Q FY 2020 using FY 2019 funds. Final phase 2 integration and testing will complete in 2Q FY 2020 using FY 2019 funds. Final test and project closeout reports will be completed in 3Q FY 2020 using FY 2019 funds.</p> <p>-HALO Integration with Common Remotely Operated Weapon System (CROWS) (Army): This project will complete software modeling in 1Q FY 2019, lab prototype hardware development in 2Q FY 2019, lab prototype evaluation in 3Q FY 2020, and initiate field prototype hardware development in 4Q FY 2019.</p> <p>-Smartshooter Evaluation (Army): This project will receive test articles in 2Q FY 2019 and conduct phase 1 technical characterization in 3Q FY 2019. This project continues in FY 2020 with FY 2020 funds.</p> <p>-Transparent Ceramic Armor (Army): Contract preparation was initiated in 1Q FY 2019. Test articles will be received in 3Q FY 2019 and Phase I baseline testing will be initiated in 4Q FY 2019. This project continues in FY 2020 with FY 2019 funds. Phase I testing completes in 1Q FY 2020. Phase II performance testing will initiate in 2Q FY 2020 and complete in 3Q FY 2020 using FY 2019 funding. Final test and closeout reports will be submitted in 4Q FY 2020 using FY 2019 funding.</p> <p>-Energy Storage for Directed Energy Weapons & Sensors (Navy): This project comparatively tests foreign graphene based ultra-capacitors against industry leading domestic products. This technology enables high density energy storage necessary for advancing development of future directed energy weapons and sensors. Testing completed in FY 2018. Final test and closeout reports will be completed in 1Q FY 2019.</p> <p>-AT4 Confined Space Tandem Warhead (Army): FY 2019 New Start - This project evaluates a single-use, shoulder launched munition capable of defeating both armored and structural targets while being fired from an enclosed space. This technology eliminates the need for multiple weapons and increases effectiveness against urban structures and bunkers. If testing is</p>			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603133D8Z / <i>Foreign Comparative Testing</i>	Project (Number/Name) 313 / <i>Foreign Comparative Testing</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>successful, the Army will commence follow-on procurement and fielding. Test planning will be completed in 2Q FY 2019. Laboratory ammunition testing will be completed during FY 2019. This project continues in FY 2020 with FY 2020 funds.</p> <p>-Modular Airdrop Platform (Army): FY 2019 New Start - This project evaluates a reusable, modular airdrop pallet that uses an under-mounted airbag system for impact attenuation and is compatible for use on existing airdrop aircraft. This technology increases payload survivability and provides a rapid roll-on/roll-off capability which decreases rig/derig times. If testing is successful, the project will transition to Program Manager Force Sustainment Systems Cargo Aerial Delivery Program of Record. Contract preparation and award will take place in 1Q FY 2019 with test articles received in 3Q FY 2019. Ground testing will initiate in 3Q FY 2019. This project continues in FY 2020 with FY 2020 funds.</p> <p>-Rapid Obscuring System (Army): FY 2019 New Start - This project evaluates an off-the-shelf, 360 degree vehicle protection system currently fielded and in use with several NATO militaries. This technology increases survivability against anti-armor weapons. If testing is successful, the final test report will be presented to Program Manager Vehicle Protection Systems with recommendations for use on the Next Generation Combat Vehicle. Contract preparation and award will take place in 1Q FY 2019 with test articles received in 2Q FY 2019. Phase I testing to create cloud modeling parameters will take place during 2Q FY 2019. Phase II field testing of smoke grenades against relevant sensors will take place in 3Q FY 2019. The project will finish with a closeout report in 4Q FY 2019.</p> <p>-Uncooled 120 Hertz Longwave Infrared Focal Plane Arrays for Night Vision Sensors (Army): FY 2019 New Start - This project tests foreign focal plane array technologies with enhanced refresh rates and increased resolution for application to next-generation Night Vision Devices and Soldier Borne Sensors. This technology increases situational awareness and lethality. If successful, the arrays will transition to the Army for incorporation onto night vision sensor programs and Soldier Borne Sensors. Contract preparation and award will take place in 1Q FY 2019. Test articles received in 2Q FY 2019. Test planning and lab integration will take place throughout FY 2019. This project continues in FY 2020 with FY 2020 funds.</p> <p>-Magnetic Signature Duplicator Systems (Army): FY 2019 New Start - Comparatively tests vehicle mounted advanced magnetic signature duplicator systems against anti-tank landmine weapons. This technology may double the standoff range and addresses new threats to enable increased mobility of U.S. forces in contested near-peer combat environments. If successful, the technology will transition to Product Manager Counter Explosive Hazards for follow-on procurements. Contract preparation and award will take place in 3Q FY 2019 with test articles to be received at the beginning of 4Q FY 2019. Phase I mine neutralization testing will take place in 4Q FY 2019. This project continues in FY 2020 with FY 2020 funds.</p> <p>-Hydrogen Fuel Cell Technology for Small Unmanned Aerial Systems (Air Force): FY 2019 New Start - This project comparatively tests foreign fuel cell technology for Small Unmanned Aerial System applications with improved energy density and reliability. This technology improves performance while reducing costs and increasing competition. If testing is successful, the fuel cells will transition to the Desert Hawk Unmanned Aerial Vehicle program. Contract preparation and award will take place in 2Q FY 2019 with test articles received in 3Q FY 2019. Phase I laboratory testing will take place in 4Q FY 2019. This project continues in FY 2020 with FY 2020 funds.</p>			
			FY 2020

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603133D8Z / <i>Foreign Comparative Testing</i>	Project (Number/Name) 313 / <i>Foreign Comparative Testing</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>-Small Size, Weight, and Power (SWaP) Midwave Infrared (MWIR) Camera for Small Unmanned Aerial Systems (Air Force): FY 2019 New Start - This project evaluates a low-cost, small SWaP day/night camera integrated into an optical payload for Group 1 Unmanned Aerial Systems. This effort enables affordable fielding of MWIR technology while increasing competition and reducing technical risk for Small Unmanned Aerial System programs. If testing is successful, the camera will transition to the Tactical Offboard Sensing program. Contract preparation and award will take place in 1Q FY 2019 with test articles received by 3Q FY 2019. Phase I laboratory testing to be completed in 4Q FY 2019. This project continues in FY 2020 with FY 2019 funds. Phase II integration and performance testing will finish in 1Q FY 2020 using FY 2019 funds. Phase III operational testing will finish in 2Q FY 2020 using FY 2019 funds. Project will complete with a final closeout report in 3Q FY 2020 using FY 2019 funds.</p> <p>-Enhancing DoD Circuit Card Repair (Navy): FY 2019 New Start - This project evaluates a portable, off-the-shelf system for testing of printed circuit boards. This technology enables circuit card analysis and repair at the organizational and intermediate levels which improves readiness and reduces maintenance costs. If successful, the Naval Sea Systems Command will purchase an additional 26 units for enhancing circuit card capability DoD-wide. Contract preparation and award will occur in 3Q FY 2019. Test articles will be received in 4Q FY 2019. This project will continue in FY 2020 with FY 2020 funds.</p> <p>-Passive, Fixed Sonar Targets (Navy): FY 2019 New Start - This project evaluates a passive, non-electronic, omni-directional, fixed target for calibrating Continuous Active Sonar systems on Naval platforms. This technology improves pre-deployment sonar accuracy tests which increases confidence and readiness. If successful, the technology will transition to Naval Sea Systems Command for fielding. Contract preparation and award will take place in 2Q FY 2019 with test articles received in 3Q FY 2019. Phase I testing in a controlled acoustic environment will take place in 4Q FY 2019. This project continues in FY 2020 with FY 2019 funds. Phase II suitability testing will take place in 2Q FY 2019 at Atlantic Undersea Test and Evaluation Center using FY 2019 funds. The project is projected to finish in 3Q FY 2020.</p> <p>-Simultaneous Multi-Channel Modem (USSOCOM): FY 2019 New Start - This project evaluates an off-the-shelf device that autonomously disaggregates and transports data over multiple networks simultaneously. This technology enables secure real-time streaming of high definition full motion video in austere environments with limited communication infrastructure. If successful, will transition to SOCOM Program Executive Office Command Control Communications Computers and Intelligence. Contract preparation and award will take place in 2Q FY 2019 with test articles received early in 3Q FY 2019. Developmental testing will take place in 3Q FY 2019 with operational testing of full motion video transfer in 4Q FY 2019. This project continues in FY 2020 with FY 2020 funds.</p> <p>FY 2020 Plans:</p> <p>-Insensitive Munitions Fuze for the M67 Fragmentation Hand Grenade (Army): Conduct down select in 1Q FY 2020. Conduct fragmentation testing and lethality analysis in 2-3Q FY 2020. Complete final test and close-out reports in 4Q FY 2020. Funding decreases in FY 2020 due to project completion.</p> <p>-Panoramic Infrared Sensor Test (Navy): In FY 2020, Shipboard Testing will be conducted. Final test and closeout report will be completed in 4Q FY 2020.</p>			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
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 2018	FY 2019	FY 2020
<p>-Smartshooter Evaluation (Army): This project will continue with live fire testing throughout FY 2020. Final test and closeout reports will be submitted in 4Q FY 2020.</p> <p>-AT4 Confined Space Tandem Warhead (Army): Phase 4 live fire ammunition testing will take place in 1-2Q FY 2020. The project will complete in 3Q FY 2020 with a closeout report.</p> <p>-Modular Airdrop Platform (Army): Demonstration airdrop at Fort Bragg will take place in 4Q FY 2020. The project will conclude by the end of FY 2020 with a closeout report.</p> <p>-Uncooled 120 Hertz Longwave Infrared Focal Plane Arrays for Night Vision Sensors (Army): Phase I size weight and power verification will complete in 1Q FY 2020. Phase II frame rate verification will also complete in 1Q FY 2020. Phase III sensitivity testing will complete in 2Q FY 2020. Phase IV thermal time constant verification will complete in 3Q FY 2020. Phase V extended solar exposure testing will complete in 4Q FY2020. The project will close in 4Q FY 2020 with a closeout report.</p> <p>-Magnetic Signature Duplicator Systems (Army): Phase II Operational Testing will occur in 3Q FY 2020. The project will complete with a closeout report in 4Q FY 2020.</p> <p>-Hydrogen Fuel Cell Technology for Small Unmanned Aerial Systems (Air Force): Phase II operational testing will occur throughout FY 2020. Project will complete with a final closeout report in 4Q FY 2020.</p> <p>-Enhancing DoD Circuit Card Repair (Navy): Phase I acceptance testing will complete in 1Q FY 2020. Phase II information assurance evaluation will complete in 2Q FY 2020. Phase III demonstrations by maintenance personnel in the field will complete in 3Q FY 2020. The project will complete in 4Q FY 2020 with the closeout report.</p> <p>-Simultaneous Multi-Channel Modem (USSOCOM): Operational testing will complete in 1Q FY 2020. The project will finish with a closeout report in 2Q FY 2020.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 funding commitment is reduced as currently selected projects complete their 24-36 month evaluation and are transitioned.</p>				
<p>Title: Foreign Comparative Testing Prototype Development Focus Areas</p> <p>Description: Previously funded effort. The FCT program will select new projects to evaluate allied/partner nation technologies that address emerging DoD capability gaps and provide substantial cost, schedule, and/or performance benefit to the warfighter. As projects are selected they will be reported individually. Prototype development will be aligned to the 2018 National Defense Strategy (NDS) to deliver increased readiness and a more lethal Joint Force while strengthening alliances, attracting new partners, and achieving greater performance and affordability.</p> <p>FY 2019 Plans: During FY 2019, FCT will prioritize selecting projects supporting the NDS and DoD modernization priorities including: - Fully Networked Command Control and Communications - Space</p>		4.073	6.408	13.765

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603133D8Z / <i>Foreign Comparative Testing</i>	Project (Number/Name) 313 / <i>Foreign Comparative Testing</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<ul style="list-style-type: none"> - Missile Defense - Cybersecurity – Offense and Defense - Nuclear Modernization - Hypersonics – Offense and Defense - Directed Energy - Machine Learning and Artificial Intelligence - Secure Trusted On-shore Microelectronics - Quantum Technology <p>In addition to the above areas of technology development, FCT will select programs that resolve emergent urgent operational needs with field-ready allied technologies and programs that promise substantial life-cycle cost savings/avoidance in fielded systems.</p> <p>FY 2020 Plans: During FY 2020, FCT will prioritize selecting projects supporting the NDS and DoD modernization priorities:</p> <ul style="list-style-type: none"> - Fully Networked Command Control and Communications - Space - Missile Defense - Cybersecurity – Offense and Defense - Nuclear Modernization - Hypersonics – Offense and Defense - Directed Energy - Machine Learning and Artificial Intelligence - Secure Trusted On-shore Microelectronics - Quantum Technology <p>In addition to the above areas of technology development, FCT will select programs that resolve emergent urgent operational needs with field-ready allied technologies and programs that promise substantial life-cycle cost savings/avoidance in fielded systems.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: The FY 2018 and FY2019 funding levels are lower than the baseline for these focus area, which is listed under FY 2020. This is because once projects are selected and funded during the years of execution (FY 2018/FY 2019), the funds for these projects are reported elsewhere in the R-2. Projects have not been selected for FY 2020.</p>			
Accomplishments/Planned Programs Subtotals		21.715	24.277

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603133D8Z / <i>Foreign Comparative Testing</i>	Project (Number/Name) 313 / <i>Foreign Comparative Testing</i>
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.		
E. Performance Metrics -Project performance metrics for FY 2020 will include specific details to each effort and include measures identified in individual project plans. Project completions and successes are monitored against schedules and deliverables stated in the proposals and statements of work. The metrics include items such as target milestone dates, specific performance measures, fielding dates, and demonstration goals. Measurable Outcomes: -FCTs will demonstrate capability objectives within 24-36 months. -In FY 2018, FCT had a transition rate of 67 percent (4 of 6) for completed projects and contributed to the DoD Performance Goal of supporting efforts and projects which engage Joint and interagency partners to address Joint Force and Combatant Command capability gaps.		

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity					R-1 Program Element (Number/Name)							
0400: Research, Development, Test & Evaluation, Defense-Wide / BA 3: Advanced Technology Development (ATD)					PE 0603225D8Z / Joint DOD/DOE Munitions Technology Development							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	17.959	18.602	18.773	-	18.773	19.048	19.379	19.743	20.161	Continuing	Continuing
225: Joint DOD/DOE Munitions	-	17.959	18.602	18.773	-	18.773	19.048	19.379	19.743	20.161	Continuing	Continuing

A. Mission Description and Budget Item Justification

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

The JMP has established a successful collaborative community of DoD and DOE scientists and engineers that develop technologies of interest to both Departments within a structured framework of technical reviews and scheduled milestones. The JMP is administered and monitored by the Office of the Secretary of Defense (OSD) and reviewed annually by the Munitions Technical Advisory Committee (TAC), which is comprised of munitions laboratory technical directors and senior executives from the Army, Navy, Air Force, Special Operations Command, the Defense Threat Reduction Agency, OSD, and DOE. Projects are organized in eight Technology Coordinating Groups (TCG) that bring together the disciplines necessary to properly evaluate technical content, relevance, and progress. The TCGs conduct semi-annual technical peer reviews of JMP projects and plans. DoD Service laboratory technical experts lead each of the TCGs to ensure that the technologies under development address high-priority DoD gaps, needs, and challenges. The JMP also promotes more in-depth technical exchange via short-term visiting scientist and engineer assignments at both the DOE and the DoD laboratories.

The JMP also works with the Defense Ordnance Technology Consortium (DOTC) and the National Armaments Consortium (NAC) of industrial suppliers to equitably and efficiently transition JMP technologies to defense industrial contractors.

The integrated DoD and DOE efforts within the JMP are transitioning new munitions' technologies to the Department and the defense industrial base through the advanced development process. The JMP is a focal point for collaborative work by nearly 300 DoD and DOE scientists and engineers. Technical leaders from both Departments consider the JMP a model of cooperation, both within their respective departments and between departments. The highly challenging technical objectives of the 32 current projects require multi-year efforts and sustained, long-term investments to achieve success.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603225D8Z I <i>Joint DOD/DOE Munitions Technology Development</i>
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B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	18.662	18.644	18.827	-	18.827
Current President's Budget	17.959	18.602	18.773	-	18.773
Total Adjustments	-0.703	-0.042	-0.054	-	-0.054
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.667	-			
• FFRDC Reduction	-0.036	-0.042	-	-	-
• Other Program Adjustments	-	-	-0.054	-	-0.054

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
225: Joint DOD/DOE Munitions	-	17.959	18.602	18.773	-	18.773	19.048	19.379	19.743	20.161	Continuing	Continuing

A. Mission Description and Budget Item Justification

The JMP seeks to develop technological advances in several munitions subject areas. These include: 1) improved modeling and simulation tools for munitions and system design and evaluation, including evaluation of lethality, vulnerability and the design of energetic materials (EM) and insensitive munitions (IM), 2) novel experimental techniques and material property databases to support modeling and simulation, 3) higher power and safer explosives and propellants, 4) miniaturized, lower-cost, and higher reliability fuzes, initiators, power systems, and sensors, 5) design tools to enable development of higher performance warheads and weapons, such as penetrators, that are hardened against high impact loads, and 6) tools to assess the health and reliability of the munitions stockpile and predict lifetimes based on these assessments. The supporting experimental research requires the development of new technologies related to the synthesis, processing, formulation, and characterization of advanced munition materials, components, and systems. This involves energetic material research, new fuzing concepts, dynamic testing of munition materials, and advanced characterization including high-rate in-situ diagnostics.

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

Each of the 32 projects has a detailed five year plan with objectives, tasks, deliverables and milestones that is approved annually by a group of 20-plus SES from the DoD munitions laboratories.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
Title: Computational Mechanics and Material Modeling	6.202	6.141	6.179
Description: Projects in this technical focus area develop physics-based computational tools, material models, and calibration and validation databases that support the design and development of weapon systems. These capabilities are intended to predict the complex phenomena across significant length (meso to continuum) and time (nano-seconds to minutes) scales. The tools will provide coupled, multi-physics and chemistry modeling capabilities that are scalable to massively parallel architectures for solving diverse problems across the weapons systems' research and development and acquisition communities. Numeric tools are the foundation that makes possible the integration of mechanics, materials science, physics, and chemistry. This focus area also includes an extensive experimental component consisting of: 1) phenomenological or "discovery" experiments that provide the physics basis for model development, 2) experiments directly coupled to model development and application, such as characterization, calibration, and validation experiments, or 3) the development of advanced test methods or device development.			
The specific projects in computational mechanics and material modeling are: - CTH (Sandia code) shock physics and Sierra/Solid Mechanics (SM) codes & model development and supporting experiments.			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
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 2018	FY 2019
<ul style="list-style-type: none"> - Arbitrary Lagrangian-Eulerian Three-Dimensional (ALE3D) code and model development. - Composite case technology and modeling. - Dynamic properties of materials, modeling and validation. - Energetic materials and polymers under dynamic and thermal loading. - Fragment impact and response experiments. <p>FY 2019 Plans: Release CTH Version 13.0. Release Sierra Mechanics Version 4.52. Determine the effects of thermodynamic non-equilibrium under high strain rate considered using the multi-scale methods in Carta Blanca. Complete Ignition/violence characterization tests on pedigreed PBXN-9, Comp B, and Plastic Bonded eXplosive (PBX) 9501. Release ALE3D Version 4.30. Transfer key portions of Lawrence Livermore National Laboratory's Siboka workflow tools to one or more DoD platforms (Army Armament Research, Development & Engineering Center and Air Force Research Laboratory) for the development of warhead design optimization tools. Continue to improve and release the MIDAS material database to the DoD and the DOE.</p> <p>FY 2020 Plans: Improved CTH numerics to obtain identical results over all platforms CTH Version 14.0 Verify and validate composite models for oblique impact experiments Magnetic ramp compression experiments for insensitive high explosives Improvements to ZAPOTEC (Sandia Code) usability for improved lethality and vulnerability analyses Develop damage-based failure models for Sierra/SM Release ALE3D version 4.34. Extend adaptive mesh refinement capability to 3D in ALE3D Improve accuracy in smooth particle hydrodynamics and adding implicit auto-contact in ALE algorithms Advanced material models for shear localization Deep learning for Fast Running Model (FRM) generation Complete implementation of new porosity based ductile damage model within ABAQUS with micro-inertia and coalescence Effects of thermodynamic non-equilibrium under high strain rate considered using the multi-scale methods in Carta Blanca Ignition and violence characterization tests completed on pedigreed PBXN-9, Comp B, and PBX-9501 Review for off-ramp or identification of next polymers of interest for JMP</p>			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
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 2018	FY 2019
Complete PBX-9502 impact test series			
FY 2019 to FY 2020 Increase/Decrease Statement: Small changes reflect minor budget fluctuations.			
Title: Energetic Materials (EM)		5.326	5.624
Description: The goals of this technical focus area are to develop new Energetic Materials (EMs) and supporting technologies to satisfy the competing requirements for smaller, more lethal, and safer munitions. Work is primarily focused on explosives, gun and rocket propellants, and, to a lesser extent, pyrotechnics. The projects include development of: 1) new EMs, including new molecules in a range of particle sizes and morphologies, 2) new EM formulations, 3) a fundamental understanding of energetic properties and performance, and 4) computational tools for analysis of performance and sensitivity. New materials and formulations are developed with the recognition that costs must be reasonable, chemical feed stocks reliable, and manufacturing processes suitable for scale-up to production levels.			
Both Federal statute and Department policy direct the development of safer, less sensitive munitions. Making munitions less sensitive while maintaining explosive or propellant performance is a difficult challenge. This goal is best attained through a combination of new EM development, EM characterization, and more sophisticated modeling and simulation tools. It is cost prohibitive to qualify weapons for compliance with insensitive munitions requirements through testing alone. A better, and in many cases the only means, to qualify these weapons is with the combination of analysis based on validated computational tools and a few well-designed tests.			
The Department also needs munitions that provide selectable effects and improved lethality. To achieve these effects, weapons designers need to thoroughly understand the performance of EMs used in both the main weapon fill and the initiation systems. Distributed fuzing systems can provide selectable effects as well as safer munitions, but such complex, small-scale systems require more complete knowledge of EM detonation physics and in some cases, new EMs designed for this application.			
The desire for smaller and lighter munitions is driven in part by recommendations of the Long Range Research and Development Program Plan (LRRDPP) and the increasing dependence on unmanned weapons platforms and to some extent by the need to reduce logistical burden, especially energy consumption. New EMs are needed to meet the munitions weight and size requirements while maintaining and improving lethality, effects, and safety.			
In order to clearly establish overmatch, the Department is working to increase the range and speed of weapons and to develop weapons against hardened targets. This thrust includes the development of hypersonic and hyper-velocity weapons. These applications subject EMs to high accelerations and shock loads. To support the development of these new systems, we need			

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>to improve our ability to model EM under higher impact loads and to characterize relevant properties to determine their ability to survive in these aggressive environments. DoD may also need to develop new, more robust EMs that survive impact loads while maintaining lethality and the ability to initiate weapons under extreme conditions.</p> <p>TCG-III is also a forum for the exchange of information on new energetic materials, their performance and sensitivity characteristics, and physical models that can be used to predict the behavior of energetics under adverse and unplanned conditions. It is a venue in which collaboration opportunities can be identified to facilitate the transition of technology developed in the DOE to the DoD.</p> <p>The specific projects in the energetic materials technical focus area for FY 2018 are:</p> <ul style="list-style-type: none"> - Synthesis, properties, and scale-up of new energetic compounds. - Insensitive munitions and surety. - Cheetah thermochemical code development and experiments. - Micro- and nano-energetics synthesis and initiation. - Hazards analysis of energetic materials. - Reactive processes in energetic materials. - Development of tools for energetic material performance characterization. - Explosives chemistry and properties, and new energetic materials formulation. - Thermal response of energetic materials. <p>FY 2019 Plans:</p> <p>Complete graded additive manufactured (AM) booster design experiments on selected designs including non-destructive evaluation of as-printed energetic material.</p> <p>Integrate code capabilities to facilitate exploratory calculations (e.g., constant volume explosions at user specified conditions, EOS tables for hydro simulations (e.g., LEOS, SESAME), multiple constraints on formulation performance, etc.). Upgrade graphical user interface to maintain and enhance functionality (e.g., heat of formation and density estimates) and compatibility with current versions of major operating systems.</p> <p>Complete performance testing on energetic binders and then formulate main charge with energetic polymers.</p> <p>Integrate pre and post-ignition modeling of thermal response in PBX 9501.</p> <p>Report on ammonium perchlorate (AP) propellant thermal decomposition.</p> <p>Develop high-speed, high-definition imaging capability and data-extraction method for material behavior and combustion front observation.</p> <p>FY 2020 Plans:</p>			

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
Incorporate damage into combustion model and violence assessments Complete characterization of LLM-105 based AM formulation and refine reactive flow model Develop mesoscale modeling approach for obtaining reaction rate of mixtures Design a graded LX-20/LLM-105 architected experiment using latest optimization methods Reactive flow model development for tritonal, AI/HTPB formulations in Cheetah 9.0 Synthesis of hexanitrotriimidazole Reduce synthesis conditions of poly-CO using a variety of experimental approaches and final report Transition routes to new energetic plasticizers to ARL Formulation of propellants with energetic polymers Determination of the mechanism of pressurization in HMX-based formulations FY 2019 to FY 2020 Increase/Decrease Statement: The increase in FY 2019 funding enables more effort focused on advanced and disruptive energetics #to increase range, speed, lethality, and effects of munitions.				
Title: Initiators, Fuzes, and Sensors Description: The goals of this technical focus area are to develop new materials, components, diagnostic techniques, and modeling and simulation tools for fuzing systems. Initiators, fuzes, and sensors must work reliably together to prevent unintended detonation, to correctly detect intended targets, and to initiate detonation when required. Projects in this focus area support the Department's needs to miniaturize fuzing systems. Smaller systems are required for several reasons including: 1) compatibility with smaller and lighter weapons systems, 2) trading volume in munitions for other components such as additional explosives, higher energy and power density power sources, or enhanced guidance systems, 3) increasing reliability through redundancy, for example, using of two or more smaller initiating systems, and 4) upgrading existing sub-munitions with smarter and more reliable fuzing systems. The miniaturization of fuzing systems requires new material and components, new power systems, new diagnostic techniques, and improved modeling tools for microdetonics. The Department also needs weapons systems with selectable effects, and these effects may be achieved with multi-point initiation systems. Such systems are inherently more complex and require improved characterization of initiator materials and components, as well as more sophisticated modeling and simulation tools. To attain greater precision and to avoid unintended collateral effects when weapons are used in the complex environment of counter-insurgency or counter-terrorist operations, target sensors must be reliable and provide high-fidelity discrimination. Projects in this focus area are developing technologies to achieve this level of performance in compact packages. The specific projects in the initiators, fuzes, and sensors technical focus area are:		2.927	3.177	3.217

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<ul style="list-style-type: none"> - Firing Systems Technology, comprising FireMod firing set code model development and validation, 1.6 hazard classification detonator development, and initiation and detonation physics on the millimeter scale. - Safe, Arm, Fuze and Fire Technology, comprising Initiation and Detonation, and Advanced Firing System Components. - Advanced Initiation Systems, comprising diagnostics development, microdetonics, miniature initiation systems, and detonators for enhanced safety. - Thermal Battery Performance Modeling to develop a multi-physics modeling capability for thermal batteries. - Thin Film Thermal Batteries to develop, mature, and transition a method to produce a thin, conformal, low-cost thermal battery. - Vertical-Cavity Surface-Emitting Laser (VCSEL) sensors for proximity fuzing of munitions with very low size, weight, and power requirements. - Enabling Robust, Mode-Agile GPS-Denied Weapon Guidance through High-Efficiency Data Processing. <p>FY 2019 Plans: Demonstrate the ability to model thin-film batteries and couple thermal and electrical performance. Optimization of process to cut metallized glass/epoxy composites without damaging electrodes. Demonstrate 10 Volt (V), 10-cell stack at 1 ampere/square centimeter (A/cm2) with < 50 ms rise to midvoltage and no shorting. Delivery of SAR-on-SAR and ROFEC prototype hardware/software processor solution to DoD customer for evaluation. Refine fabrication and complete optical characterization of VCSEL and complete g-testing. Report status of photoactive high explosives (HE) project capabilities in preparation for specification of down-selected engineering applications, e.g., prompt versus deflagration to detonation transition (DDT) photo-active detonators.</p> <p>FY 2020 Plans: Transition to additively manufactured VSCEL lens arrays to eliminate manufacturing defects To explore the use of PML capacitor technology for use in CDU (Capacitor Discharge Unit) applications To develop GaN and AlGaIn based transistors for high voltage, high current, high di/dt solid state switches (1-2 kV, 50 A/ns) for compact firing sets Incorporate aging into battery design tool Additively manufactured plane wave generator prototypes delivered to DoD (ARDEC) Develop performance metrics for wave-shaping enhanced IM initiation train Status achievements, capabilities, and lessons-learned obtained through collaborative Tailored Flyers research with NSWC/Crane Status development and integration of a “standard” set of experiments necessary for calibration and validation of detonator-scale HE performance in numerical hydrocodes</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement:</p>			

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
The increase of FY 2019 would accelerate the transition of technology to the DoD for advanced modeling to optimize new weapons firing and detonation system design.			
Title: Warhead and Penetration Technology Description: This focus area supports the development of new warheads and penetrator weapons through advances in materials processing and characterization, instrumentation, and computational codes. Significant increases in warhead performance are directly attributed to our ability to understand and accurately model the physics and fine details of new warhead designs, and to advances in increasingly sophisticated material processing. The Department's requirement to achieve more precise weapon effects with minimum collateral damage is supported by work on controlled fragmentation, non-fragmenting warhead cases, and multiphase blast explosives (MBX). More recently, increases in performance and reductions in vulnerability are being achieved through improved warhead integration into munitions using a systems-oriented approach. The goals for penetrator weapons are to investigate, develop, and transition advanced technologies for the design, development, and performance assessment of the next generation of high performance, precision strike weapons. This effort directly supports national initiatives to defeat hard and deeply buried targets, which are proliferating worldwide, and to deny/defeat weapons of mass destruction. The work addresses high-velocity penetration into granular materials (sand and soil), penetration into advanced high-strength, high performance, and ultra-high-performance concretes, new penetrator materials and designs, and non-inertial onboard instrumentation. FY 2019 Plans: Add a granular temperature model to ALE3D for improved modeling of MBX. Element conversion of finite element modeling and discrete element modeling (FEM-DEM) with improved stability in ALE3D v4.32. Complete mechanistic mesoscale simulations for concrete penetration. Develop thermomechanical solution framework for hard-target penetration. Concrete perforation and penetration modeling and experiments on high performance and ultra-high performance material. Simulate 3D compact shear sample experiment on two materials of interest – possibly stainless steel or tantalum – using the 3D embedded element formulation. Exercise new model within CartaBlanca for the sweeping detonation wave damage problem on tantalum. FY 2020 Plans: Improve gas phase diagnostics to measure aluminum particle temperature over time, and digital image holography improvements to measure particle drag and reaction rates Generate synthetic fragment data set for improvement and testing of fragment tracking software Integrate Peridynamics Multiscale (PDMS) into a DoD code such as EPIC Granular temperature model for Advanced Multidomain Coupling (AMC) in ALE3D		2.828	2.870
			2.908

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
Scaling law for Jones-Wilcings-Lee (JWL) equation of state with dense particulates in ALE3D White paper on continuum model and selected validation results Progress assessment and final 5-year report on dynamic behavior of concrete Complete characterization and constitutive modeling of AF9628 (Eglin Steel) Demonstrate sweeping wave drive control utility in munitions design FY 2019 to FY 2020 Increase/Decrease Statement: The increase of funding from FY 2019 to provide improvements in image-based fragment tracking. Improved data used for model validation for fast-running lethality and collateral damage codes.			
Title: Munitions Lifecycle Technologies Description: This focus area supports improving the Department's ability to understand measure, predict, and mitigate safety and reliability problems caused by materials aging and degradation in weapons systems. Current stockpile assessment methods typically focus on addressing materials aging and reliability problems after they occur, rather than anticipating, predicting, and avoiding future problems or failure mechanisms. The overall objective of this work is to develop a toolset of computational models that are able to quantitatively predict materials aging processes and ultimately improve the long-term reliability of weapons systems, subassemblies, and/or components. These objectives are achieved by identifying aging mechanisms, quantifying the rates at which those aging mechanisms occur, developing predictive models, and using these models to predict the munitions stockpile reliability. An additional objective of this work is to develop technologies and methodologies to enable munitions health management and condition-based maintenance. The specific projects in the munitions lifecycle technologies focus area are: - Predictive Materials Aging, including solder interconnect reliability, corrosion of electronics, and adhesive degradation. - Microelectromechanical systems (MEMS) reliability. - Military use of commercial off-the-shelf (COTS) electronics. - Complex system health assessment. - Physical/chemical reactive transport modeling of material/system aging and reliability. FY 2019 Plans: Experimentally characterize and model DOE & DoD material(s) of interest based on suspected impact on aging and outgassing. Simulate multi-material experiments (MME) on DoD system (MLRS M26 ignitor). Complete 3D, MME experiments for validation on identified systems of interest. Simulate 3D compact shear sample experiment on two materials of interest – possibly stainless steel or tantalum – using the 3D embedded element formulation. Use 3D experiments to determine outgassing effects of critical materials.		0.676	0.790
			0.807

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>Transition tin whisker mitigation to commercial plating houses.</p> <p>Develop datasets for electrochemical kinetics and damage distributions on aluminum under varying humidity and chloride-loading conditions.</p> <p>FY 2020 Plans:</p> <p>Develop datasets for electrochemical kinetics and damage distributions on aluminum under varying humidity and chloride-loading conditions.</p> <p>Compile long-term performance data for coatings that resist tin whisker penetration</p> <p>Transition material aging and reliability tool to the DoD (NSWC-IH), and close project.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement:</p> <p>Small fluctuations reflect minor budget adjustments.</p>			
Accomplishments/Planned Programs Subtotals		17.959	18.602
C. Other Program Funding Summary (\$ in Millions)			
N/A			
Remarks			
D. Acquisition Strategy			
N/A			
E. Performance Metrics			
<ol style="list-style-type: none"> 1. Transition of technologies developed by the Joint DoD/DOE Munitions Technology Program are tracked and documented. In FY 2017, there were over 70 transitions to DoD weapons programs and personnel. 2. Attendance and technical interactions at the semiannual meetings of the eight Technology Coordinating Groups (TCGs) are tracked and documented. 3. Laboratory Five-Year Plans are prepared, evaluated, analyzed and approved by DOE and DoD management and technical staff. 4. TCG Chairmen's Annual Assessments for each TCG are critically reviewed by the Technical Advisory Committee (TAC) to determine progress, validate transition plans, and verify relevance of each project. 5. The five-year plans and all news start projects are approved each year by the TAC. Adjustments are made to the five-year plan based on recommendation of the TAC to meet the most compelling gaps, needs, or challenges of the DoD and the DOE. 6. Project progress toward goals and milestones is assessed at each biannual TCG meeting and critically reviewed annually by the TAC. 7. Annual technical reports, papers, and presentations are tracked and documented. 			

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	39.047	12.658	18.430	19.429	-	19.429	19.661	19.951	20.267	20.697	Continuing	Continuing
328: Science and Technology Analytic Assessments	39.047	12.658	18.430	19.429	-	19.429	19.661	19.951	20.267	20.697	Continuing	Continuing

A. Mission Description and Budget Item Justification

This Program Element (PE) directly supports Strategic Intelligence Analysis Cell (SIAC) for the Office of the Under Secretary of Defense, Research and Engineering (OUSD(R&E)) with assessments and analysis to inform the strategic direction of research, development, and acquisition of innovative capabilities to meet the emerging threats from the diverse range of state and non-state actors confronting the United States. The analysis uses the operational context of Joint and cross-domain missions by leveraging Combatant Commands (COCOM) and Joint Staff warfighting concepts. Throughout this process the analysis will be tightly coupled with both the Intelligence community and the operational community through the COCOM.

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

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	13.154	19.472	19.485	-	19.485
Current President's Budget	12.658	18.430	19.429	-	19.429
Total Adjustments	-0.496	-1.042	-0.056	-	-0.056
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.471	-			
• FFRDC Reduction	-0.025	-0.042	-	-	-
• Other Program Adjustments	-	-	-0.056	-	-0.056
• Congressional Reduction	-	-1.000	-	-	-

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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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
328: Science and Technology Analytic Assessments	39.047	12.658	18.430	19.429	-	19.429	19.661	19.951	20.267	20.697	Continuing	Continuing

A. Mission Description and Budget Item Justification

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

Operational and Technical Assessments are informed by comprehensive Kill Chain Analysis (KCA) across all domains and the time continuum from 2020-2040 to identify prioritized operational issues and associated actionable technology focus areas. These products support detailed analyses and assessments to help shape technology investment decisions and inform the strategic direction of capability development. Because of the 20 year timeframe, these analyses will also help to inform requirements rather than waiting for current processes to develop them. Main lines of effort include the following activities:

- KCA across Defense Planning Scenarios and other relevant DoD Vignette to identify and characterize capability disadvantages and opportunities across the battlespace.
- Develop and maintain an all source-like database of military capabilities and a standalone software application, KCA Results Display System, to provide data and analysis on operational issues.
- Produce operational impact assessments of potential technology improvements to military capabilities in the near, mid, and far term.
- Consolidate Technology focused roadmaps of U.S. capability development and S&T developmental strategic plans.

Technical Analysis and Quick Reaction Analysis Team perform engineering level systems analysis using the DoD sponsored FFRDC/UARC and Department of Defense and Department of Energy (DoD/DoE) laboratories. Using these research performers, previously sponsored research on relevant topics is leveraged in the new research providing value and experience on new projects. Main lines of effort include the following activities:

- Technical threat assessments building on intelligence community products for identifying gaps in U.S. capability for critical threats.
- Quantitative analysis of potential new technology and concepts to address capability gaps and counter emerging threat technologies.
- Architecture development and evaluation to develop new U.S. capability.
- Independent assessment of critical capability and technology development.

Analytic Tools include modeling, simulation, and analysis (MS&A), computer based engineering models, and purposed designed equipment to demonstrate or confirm theoretical performance of technical concepts. Main lines of effort include the following activities:

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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		
<div>- Develop analytic tools to inform and provide decision support to resourcing recommendations.</div> <div>- Develop strategic analytic tools enabling the analysis and evaluation of critical capability and technology development.</div> <div>- Integrated MS&A leveraging Service- and Agency-level virtual and constructive resources to provide insight into complex acquisition and operational decisions.</div> <div>- Red Teaming existing and planned U.S. capabilities and weapons systems using emerging threat systems and capabilities in emerging scenarios.</div>					
B. Accomplishments/Planned Programs (\$ in Millions)			FY 2018	FY 2019	FY 2020
Title: Science and Technology Analytic Assessments			12.658	18.430	19.429
<p>Description: Science and Technology (S&T) Analytic Assessments Program Element (PE) directly supports the development of innovative capabilities to meet the emerging threats from the diverse range of state and non-state actors confronting the Unites States. These capabilities support the objective in the 2018 National Defense Strategy and include: space and terrestrial-based indications and warnings systems, integrated and resilient Intelligence, Surveillance, Reconnaissance (ISR) platforms, strategic lift, long-range precision strike weapons, missile defense technologies, undersea systems, remotely operated vehicles and technologies, special operations forces, the Cyber Mission Force, ground systems, and others outlined in the 2015 National Military Strategy. Throughout this process the analysis will be tightly coupled with both the Intelligence community and the operational community through the Combatant Commands.</p> <p>Accordingly, the following activities are planned for FY 2019 and FY 2020.</p> <p>FY 2019 Plans:</p> <p>Operational and Technical Assessments:</p> <p>Specific tasks that will be executed within the Kill Chain Analysis (KCA) area include:</p> <div><div>- Conduct KCA on new threat scenarios and projected threat capabilities.</div><div>- Assess emerging operational scenarios against future red and blue capability timelines.</div><div>- Update existing KCA based on emerging red and blue capability assessments.</div><div>- Develop and maintain technology development road maps conveying a comprehensive picture of U.S. technology development.</div></div> <p>Quick Reaction Analysis Team (QRAT):</p> <p>Quick Reaction Analytic efforts responding to critical questions related to potential vulnerabilities in current and future U.S. systems to identify opportunities or challenges related to developing foreign capabilities. These short studies typically focus on the following capability areas: foreign, integrated air and missile defense capabilities; options for U.S. electronic warfare and capability to counter adversaries; resiliency in U.S. Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) systems and options to counter adversaries C4ISR capabilities; ground combat offensive and defensive capabilities, air dominance and missile defense, and undersea engagements. The QRAT is enabled by a weekly meeting of FFRDC/UARC lead contacts to review on-going and emerging tasks and collaborative technical interchanges on OUSD(R&E) focus areas.</p> <p>Engineering Analysis (Strategic Studies):</p>					

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B. Accomplishments/Planned Programs (\$ in Millions)			FY 2018	FY 2019	FY 2020
<p>Strategic studies are 6-12 month engineering level systems analysis. Strategic studies parametrically define the emerging threat space, determine feasibility of potential solutions and parametrically analyze the solution trade space. Specific tasks that will be executed within the strategic studies area include:</p> <ul style="list-style-type: none"> - Explore feasibility and potential of next generation electronic warfare technologies. - Analyze potential components of a theater-level electronic warfare threat awareness and battle management architecture. - Evaluate options to increase survivability of US weapons against advanced Integrated Air Defense System (IADS) and counter-measures - Identify and evaluate countermeasures to adversary smart weapons. - Identify and evaluate potential technologies' to aid tracking and communications for underwater operations. <p>Analytic tool development</p> <ul style="list-style-type: none"> - Develop analytic tools to inform and evaluate new technologies' potential to counter emerging threats and exploit adversary vulnerabilities from air, land, sea, and space domains. - Develop analytic tools to provide inform and provide decision support to resourcing recommendations. - Develop integrated modeling, simulation, and analysis tools to aid complex acquisition decisions. - Red Team U.S. capabilities and systems in the context of emerging threats in relevant scenarios. <p>FY 2020 Plans:</p> <p>Operational and Technical Assessments:</p> <p>Specific tasks that will be executed within the Kill Chain Analysis (KCA) area include:</p> <ul style="list-style-type: none"> - Conduct KCA on new threat scenarios and projected threat capabilities. - Assess emerging operational scenarios against future red and blue capability timelines. - Update existing KCA based on emerging red and blue capability assessments. - Develop and maintain technology development road maps conveying a comprehensive picture of U.S .technology development. - Explore the optimization of hypersonic technology in the US offensive and defensive arsenal through operational impact and cost benefit analysis across all relevant operational scenarios. <p>Quick Reaction Analysis Team (QRAT):</p> <p>Quick Reaction Analytic efforts respond to critical questions related to potential vulnerabilities in current and future U.S. systems to identify opportunities or challenges related to developing foreign capabilities. These short studies focus on emerging technology areas, emerging threat capability development, U.S. requirements to meet challenges and topical questions from USD(R&E) senior leadership.</p> <p>Engineering Analysis (Strategic Studies):</p>					

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Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603288D8Z / <i>Science and Technology (S&T) Analytic Assessments</i>	Project (Number/Name) 328 / <i>Science and Technology Analytic Assessments</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>Strategic studies are 6-12 month engineering level systems analysis. Strategic studies parametrically define the emerging threat space, determine feasibility of potential solutions and parametrically analyze the solution trade space. Specific tasks that will be executed within the strategic studies area include:</p> <ul style="list-style-type: none"> - Explore the feasibility and trade space options for Joint, fully networked command control and communications capabilities across domains. - Identify the early applications for artificial intelligence and autonomous systems to address national defense challenges. - Explore the feasibility and trade space options for countering adversary's emerging intelligence, surveillance and reconnaissance capabilities. - Explore feasibility and potential early applications of directed energy for offensive and defense capabilities. - Analyze the trade space of Geostationary Earth Orbit (GEO), Medium Earth Orbit (MEO), and Low Earth Orbit (LEO) capabilities in the context of operational impact, resiliency, affordability, and time to orbit. <p>Analytic tool development</p> <ul style="list-style-type: none"> - Develop analytic tools to inform and evaluate new technologies' potential to counter emerging threats and exploit adversary vulnerabilities from air, land, sea, and space domains. - Develop analytic tools to provide inform and provide decision support to resourcing recommendations. - Develop integrated modeling, simulation, and analysis tools to aid complex acquisition decisions. <p>Red Team U.S. capabilities and systems in the context of emerging threats in relevant scenarios.</p> <p><i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> Inflation Adjustment.</p>			
Accomplishments/Planned Programs Subtotals		12.658	18.430
C. Other Program Funding Summary (\$ in Millions) N/A			
Remarks			
D. Acquisition Strategy N/A			
E. Performance Metrics			
<ul style="list-style-type: none"> - Critical gaps in U.S. capability are identified and published in an annual capstone document. - U.S. technology development is documented in comprehensive road maps and capability development gaps are identified. - Potential solutions for capability development gaps are identified and assessed measured against the operational impact and technical feasibility 			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
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
<p>- New architectures and evaluation criteria for developing U.S. capability are identified and assessed for operational and technical trade space options.</p>		

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity					R-1 Program Element (Number/Name)							
0400: Research, Development, Test & Evaluation, Defense-Wide / BA 3: Advanced Technology Development (ATD)					PE 0603289D8Z / Advanced Innovative Analysis and Concepts							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	153.312	36.763	37.178	37.645	-	37.645	38.478	39.582	39.558	40.350	Continuing	Continuing
329: Advanced Innovative Analysis and Concepts	153.312	36.763	37.178	37.645	-	37.645	38.478	39.582	39.558	40.350	Continuing	Continuing

A. Mission Description and Budget Item Justification

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

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

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	36.763	37.263	37.645	-	37.645
Current President's Budget	36.763	37.178	37.645	-	37.645
Total Adjustments	0.000	-0.085	0.000	-	0.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• FFRDC Reduction Section 8024(f)	-	-0.085	-	-	-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 3					R-1 Program Element (Number/Name) PE 0603289D8Z / <i>Advanced Innovative Analysis and Concepts</i>				Project (Number/Name) 329 / <i>Advanced Innovative Analysis and Concepts</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
329: <i>Advanced Innovative Analysis and Concepts</i>	153.312	36.763	37.178	37.645	-	37.645	38.478	39.582	39.558	40.350	Continuing	Continuing

A. Mission Description and Budget Item Justification

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

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

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
Title: High-Fidelity Analysis and Concept Generation	36.763	22.553	21.465
Description: The Strategic Capabilities Office (SCO) conducts analysis to identify and accelerate the development, demonstration, and transition of potentially game-changing capabilities to shape and counter emerging threats and improve U.S. security posture. All innovative concepts developed within SCO must first undergo a phase of thorough analysis before moving forward to become a project. Due to the nature of these projects, specific applications and detailed plans are available at a higher classification level.			
FY 2019 Plans: Continue to innovate in partnership with Services Program Offices and CCMDs to identify game-changing uses of existing systems and technologies.			
FY 2020 Plans: Continue to innovate in partnership with Services Program Offices and CCMDs to identify game-changing uses of existing systems and technologies.			
FY 2019 to FY 2020 Increase/Decrease Statement:			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603289D8Z / <i>Advanced Innovative Analysis and Concepts</i>	Project (Number/Name) 329 / <i>Advanced Innovative Analysis and Concepts</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
FY 2019 to FY 2020 increase is the result of minor inflation rate adjustments.			
Title: Quick Win Projects Description: The Strategic Capabilities Office (SCO) pursues rapid research and development projects and prototyping to deliver new capabilities to the warfighter swiftly (2 years or less), called a "Quick Win." For "Quick Wins," SCO identifies, analyzes, and accelerates the development, demonstration, and transition of selected capabilities to shape and counter emerging threats, and to improve U.S. security posture. Projects focus on proving component and subsystem maturity prior to integration in major systems, and may involve risk reduction initiatives. Due to the nature of these projects, specific applications and detailed plans are available at a higher classification level. FY 2019 Plans: Start FY 2019 Quick Win projects. FY 2020 Plans: Complete FY 2019 Quick Win projects, start FY 2020 Quick Win projects. FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 to FY 2020 increase is the result of minor inflation rate adjustments.		0.000	14.625
Accomplishments/Planned Programs Subtotals		36.763	37.178
C. Other Program Funding Summary (\$ in Millions)			
N/A			
Remarks			
D. Acquisition Strategy			
N/A			
E. Performance Metrics			
Performance metrics are specific to each Advanced Innovative Analysis and Concepts effort and include measures identified in the management approach, Statement of Work (SOW), and Period of Performance (POP). In addition, completions and successes are monitored against schedules and deliverables stated in the initiative's management approach. Due to the nature of these projects, specific applications and detailed plans are available at a higher classification level			

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity	R-1 Program Element (Number/Name)											
0400: <i>Research, Development, Test & Evaluation, Defense-Wide / BA 3: Advanced Technology Development (ATD)</i>	PE 0603291D8Z / <i>Advanced Innovative Analysis & Concepts - MHA</i>											
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	0.000	14.971	13.590	14.668	-	14.668	14.839	14.279	14.875	15.173	Continuing	Continuing
251: <i>SCO Operational Costs</i>	0.000	14.971	13.590	14.668	-	14.668	14.839	14.279	14.875	15.173	Continuing	Continuing

A. Mission Description and Budget Item Justification

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

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

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	14.971	13.621	14.668	-	14.668
Current President's Budget	14.971	13.590	14.668	-	14.668
Total Adjustments	0.000	-0.031	0.000	-	0.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• FFRDC Reduction Section 8024(f)	-	-0.031	-	-	-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 3					R-1 Program Element (Number/Name) PE 0603291D8Z / <i>Advanced Innovative Analysis & Concepts - MHA</i>				Project (Number/Name) 251 / <i>SCO Operational Costs</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
251: <i>SCO Operational Costs</i>	0.000	14.971	13.590	14.668	-	14.668	14.839	14.279	14.875	15.173	Continuing	Continuing

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

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

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
Title: SCO Operational Costs - MHA Description: The Strategic Capabilities Office (SCO) conducts analysis to identify and accelerate the development, demonstration, and transition of potentially game-changing capabilities to shape and counter emerging threats and improve U.S. security posture. This funding line which is not a new program was established in FY 2018 from transferred funds from PE 0603289D8Z / Advanced Innovative Analysis and Concepts for MHA related endeavors. FY 2019 Plans: The Strategic Capabilities Office will utilize this funding for MHA related endeavors which will enable continued analysis, development, demonstration, and transition of capabilities to counter emerging threats and improve U.S. security posture. FY 2020 Plans: The Strategic Capabilities Office will utilize this funding for MHA related endeavors which will enable continued analysis, development, demonstration, and transition of capabilities to counter emerging threats and improve U.S. security posture. FY 2019 to FY 2020 Increase/Decrease Statement: Increase of \$1.078M from FY 2019 to FY 2020 budget numbers is due minor program adjustments.	14.971	13.590	14.668
Accomplishments/Planned Programs Subtotals	14.971	13.590	14.668

C. Other Program Funding Summary (\$ in Millions)
N/A

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603291D8Z / <i>Advanced Innovative Analysis & Concepts - MHA</i>	Project (Number/Name) 251 / <i>SCO Operational Costs</i>
C. Other Program Funding Summary (\$ in Millions) Remarks PE 0603291D8Z Advanced Innovative Analysis & Concepts - MHA was established in FY 2018 from transferred funds from PE 0603289D8Z / Advanced Innovative Analysis and Concepts. This is not a new program element.		
D. Acquisition Strategy N/A		
E. Performance Metrics Performance metrics will be specific to each of the MHA's that are funded. All of which include measures identified in the management approach, Statement of Work (SOW), and Period of Performance (POP). In addition, completions and successes are monitored against schedules and deliverables stated in the initiative's management approach.		

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603291D8Z / <i>Advanced Innovative Analysis & Concepts - MHA</i>	Project (Number/Name) 251 / <i>SCO Operational Costs</i>
<u>Remarks</u> Management Headquarters Activities - MHA's that are funded under the Advanced Innovative Analysis & Concepts.		

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide / BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603342D8Z / <i>Defense Innovation Unit (DIU)</i>
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	0.000	0.000	0.000	29.398	0.000	29.398	29.419	30.037	30.638	31.251	Continuing	Continuing
434: <i>DIU</i>	0.000	0.000	0.000	29.398	0.000	29.398	29.419	30.037	30.638	31.251	Continuing	Continuing

Note

Funds were transferred from PE 0603342D8W.

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

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

A. Mission Description and Budget Item Justification

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

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

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide / BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603342D8Z / <i>Defense Innovation Unit (DIU)</i>
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B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	0.000	0.000	0.000	0.000	0.000
Current President's Budget	0.000	0.000	29.398	0.000	29.398
Total Adjustments	0.000	0.000	29.398	0.000	29.398
• Congressional General Reductions	0.000	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• FFRDC (General Provisions)	0.000	0.000	0.000	-	0.000
• Transfer of DIU from WHS to USD(R&E)	-	-	29.398	-	29.398

Change Summary Explanation

Initially, DIUx was managed by the Under Secretary of Defense for Acquisition, Technology and Logistics (OUSD(AT&L)) when it was established in July 2015. In May 2016, DIUx was placed under the operational control of the Secretary of Defense and administratively managed by Washington Headquarters Services (WHS) with functional realignment of the resources across the FYDP to Washington Headquarters Services (WHS) beginning in FY 2018. In July 2018, DIUx was realigned from WHS to the Under Secretary of Defense, Research and Engineering (USD(R&E)). In August 2018, DIUx was re-designated the Defense Innovation Unit (DIU). Effective FY 2020, DIU will transfer from WHS PE 0603342D8W to OSD PE 0603342D8Z with a functional realignment of resources across the FYDP to OUSD(R&E). In FY 2018 and FY 2019, this program had \$23.498 million and \$29.198 million, respectively, in PE 0603342D8W. The FY 2020 increase of \$0.200 thousand will result in a minor re-balance of investments across the technology focus areas of Artificial Intelligence and Machine Learning, Autonomy, Human Systems, Cyber, Space, Advanced Technology Material and Manufacturing, and Power and Energy.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
434: DIU	0.000	0.000	0.000	29.398	0.000	29.398	29.419	30.037	30.638	31.251	Continuing	Continuing

Note

Funds were transferred from PE 0603342D8W.

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

A. Mission Description and Budget Item Justification

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

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

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Defense Innovation Unit - Experimental (DIU)	0.000	0.000	29.398	0.000	29.398
Description: The U.S. DoD relies on innovation to maintain our nation's ability to deter, and if need be, prevail in conflict. With outposts in Mountain View, California, Cambridge, Massachusetts, Washington, D.C., and Austin, Texas, DIU serves as a bridge between those in the U.S. Military executing our nation's highest priority problems					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense				Date: February 2019		
Appropriation/Budget Activity 0400 / 3		R-1 Program Element (Number/Name) PE 0603342D8Z I Defense Innovation Unit (DIU)		Project (Number/Name) 434 I DIU		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
with companies developing cutting technology for the commercial sector. DIU continuously experiments on methods to identify, contract, prototype, and transition novel technology with commercial entities that would not otherwise do work with the DoD. The end goal is to accelerate the adoption of cutting-edge technology and grow the defense industry base for the warfighter.						
FY 2019 Plans: DIU is one of the Secretary of Defense's priorities in advancing technology, especially artificial intelligence, autonomy, and commercial space to help the U.S. Military become more lethal and capable of defending the nation. DIU's objective is to rapidly solve the problems of our DoD customers and deploy those solutions. Accordingly, DIU requirements are driven by DoD customers in the Services, Defense Agencies, and Combatant Commands. DoD customers come to DIU with their most challenging and most compelling technological problems. DIU works to solve the challenges and issues for the Department in areas such as Artificial Intelligence and Machine Learning, Autonomy, Human Systems, Cyber, and Space.						
FY 2020 Base Plans: DIU continues its mission to identify and deliver cutting-edge commercial innovation to the Joint Force. DIU is rapidly prototyping and deploying innovative commercial technologies to fill critical capability gaps identified by DoD customers in the Services, Defense Agencies, and Combatant Commands. DIU works to solve challenges and issues for the Department in areas such as Artificial Intelligence and Machine Learning, Autonomy, Human Systems, Information Technology, and Space. In FY 2020, DIU will add two new technology focus areas of Power and Energy, and Advanced Materials to develop and deliver technologies within the fields of Tactical Power, Operational Power, Directed Energy, and Hypersonics. DIU has plans to expand it's presence in Austin, TX to optimize outreach with innovative commercial sources and enhance collaboration with the newly established Army Futures Command.						
FY 2020 OCO Plans: N/A						
FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 Plans: DIU's objective is to rapidly solve the problems of our DoD customers and deploy those solutions. Accordingly, DIU requirements are driven by DoD customers in the Services, Defense Agencies, and Combatant Commands. They come to DIU with their most challenging and most compelling technological problems. The FY 2020 increase of \$0.200 thousand will result in a minor re-balance of investments across						

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense								Date: February 2019			
Appropriation/Budget Activity 0400 / 3				R-1 Program Element (Number/Name) PE 0603342D8Z / <i>Defense Innovation Unit (DIU)</i>				Project (Number/Name) 434 / <i>DIU</i>			
B. Accomplishments/Planned Programs (\$ in Millions)											
				FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total			
the technology focus areas of Artificial Intelligence and Machine Learning, Autonomy, Human Systems, Cyber, Space, Advanced Technology Material and Manufacturing, and Power and Energy.											
Accomplishments/Planned Programs Subtotals				0.000	0.000	29.398	0.000	29.398			
C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• PE 0901583D8Z: <i>O&M</i>	10.690	11.384	17.358	0.000	17.358	17.705	18.059	18.420	18.789	Continuing	Continuing
• PE 0603342D8W: <i>DIUx</i>	23.498	29.198	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
Remarks											
DIU O&M mission support funding; prior year RDT&E funds were in PE 0603342D8W.											
D. Acquisition Strategy											
N/A											
E. Performance Metrics											
1. Speed - average days to award a prototype project at the close of a solicitation compared to the traditional acquisition system.											
2. Cost Savings - estimated amount saved as a result of DIU-driven solutions.											
3. Scale - measures the success at transitioning successful projects or methodologies, and increasing the number / diversity of partnerships within the National Security Innovation Base.											

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 3: Advanced Technology Development (ATD)</i>					R-1 Program Element (Number/Name) PE 0603375D8Z / <i>Technology Innovation</i>							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	59.895	24.825	33.068	60.000	-	60.000	68.000	76.000	84.000	92.000	Continuing	Continuing
375: <i>Technology Innovation</i>	59.895	24.825	33.068	60.000	-	60.000	68.000	76.000	84.000	92.000	Continuing	Continuing

A. Mission Description and Budget Item Justification

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

Leveraging innovative technologies from commercial startup companies has the potential to rapidly address warfighter problem sets in areas where commercial innovation outstrips government investment in the same technology areas. Through a unique partnership with other government agencies, we gain access to In-Q-Tel's vetting of innovative technologies from commercial startup companies where much of the research and development (R&D) funds are provided by the venture capital community. Small DoD investments in these companies, often in partnership with other U.S. Government agencies, further leveraging their dollars spent, provides short work programs to adapt the commercial technologies for warfighter applications. The deliverables from the work program allow the warfighters to rapidly pilot technology and concepts, with the ability to fail early and cheaply, and provide the avenue to refine warfighter requirements and transition technology from successful pilots to traditional DoD activities for integration into broader R&D efforts or acquisition programs of record.

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	64.863	83.143	95.982	-	95.982
Current President's Budget	24.825	33.068	60.000	-	60.000
Total Adjustments	-40.038	-50.075	-35.982	-	-35.982
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• FFRDC Reductions	-0.038	-0.075	-	-	-
• Congressional Reduction	-40.000	-50.000	-	-	-
• Internal Realignment for Higher Priorities	-	-	-35.982	-	-35.982

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
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	
<p>Change Summary Explanation</p> <p>In FY 2018 and FY 2019, there were Congressional reductions to the overall line. As a result, the OUSD(R&E) adjusted the line for FY 2020- FY 2024 and realigned the funds to other priority areas in the OUSD(R&E) portfolio.</p>		

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 3					R-1 Program Element (Number/Name) PE 0603375D8Z / <i>Technology Innovation</i>				Project (Number/Name) 375 / <i>Technology Innovation</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
375: <i>Technology Innovation</i>	59.895	24.825	33.068	60.000	-	60.000	68.000	76.000	84.000	92.000	Continuing	Continuing

A. Mission Description and Budget Item Justification

This Program focuses on three main areas: 1) Rapid innovation and experimentation in commercial start-up technology via In-Q-Tel to address priority warfighter problem sets, 2) Project Datahub to pilot innovative AI/ML automation for data fusion of commercial and government data to address a high-priority Combatant Command challenge; and 3) Expansion of Project Datahub to address high priority areas.

Rapid Innovation and experimentation with commercial startup technology: Through the unique partnership with the Intelligence Community (IC) in place for this effort, a wide variety of emerging commercial technologies are rapidly assessed for applicability to a wide spectrum of priority DoD problem sets. Enabling the warfighter to execute short duration pilots with these evolving technologies provides a cost effective way to leverage commercial investment for DoD purposes, sharing costs with IC partners, informing warfighter requirements for follow-on acquisition through traditional DoD channels, and allowing other DoD R&D organizations to focus their resources on both the integration of commercial technologies showing promise in these warfighter pilots as well as on traditional R&D in technologies not well served by commercial start-up companies.

Project Datahub: This effort focuses on maturing and demonstrating the automated processing of space-based Intelligence, Surveillance, and Reconnaissance (ISR), Artificial Intelligence-driven Geospatial Intelligence (GEOINT), and Fix-Find-Finish-Exploit-Assess (F3EA) into an integrated capability to aid Combatant Commander and Component forces by providing more robust long-lead Indications and Warnings (I&W) against high priority threats. The approach is composed of three innovative building blocks: 1) Machine learning techniques applied to commercial data sources and algorithms together with high-side government data sources for automated country-wide anomaly and change detection – a crucial element for enhancing indications and warnings required for deliberate action; 2) Machine-Human collaboration architecture to accelerate the F3EA joint forces targeting and decision-making cycle; and 3) Autonomous weaponeering demonstration for timely precision strikes to hold mobile missile systems at risk. Project Datahub is being implemented in the IC's secure cloud environment (C2S).

Expansion of Project Datahub. Following a successful demonstration of Project Datahub in 2017, the team was directed to expand Project Datahub to address high priority areas. Some of these problem sets may leverage similar technologies to the pilot program, with data coverage for different parts of the world and algorithms tuned for different targets of interest, while other problem sets may require completely different data, algorithms, and/or technologies. Funding in FY 2020 will allow the team to expand its efforts into additional high priority areas.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
Title: Technology Innovation	24.825	33.068	60.000
Description: The Program focuses rapid innovation and experimentation in commercial start-up technology via In-Q-Tel to address priority warfighter problem sets, and piloting innovative AI/ML automation for data fusion of commercial and government data to address high-priority Combatant Command operational challenges.			
FY 2019 Plans:			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603375D8Z / <i>Technology Innovation</i>	Project (Number/Name) 375 / <i>Technology Innovation</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<ul style="list-style-type: none"> - Continue rapid innovation and experimentation with commercial startup technology to address priority warfighter problem sets. - Integrate additional commercial data sources into core Datahub and Datahub expansion, and begin initial expansion efforts to address high priority areas. <p>FY 2020 Plans:</p> <ul style="list-style-type: none"> - Expand rapid innovation and experimentation with commercial startup technology to address additional warfighter organizations and problem sets. - Continue Datahub expansion into additional address high priority areas. <p>FY 2019 to FY 2020 Increase/Decrease Statement:</p> <p>-Due to FY 2019 and prior year funding decreases, the program line is being reset for FY 2020 to provide better stability of efforts under this program.</p>			
Accomplishments/Planned Programs Subtotals		24.825	33.068
C. Other Program Funding Summary (\$ in Millions)			
N/A			
Remarks			
N/A			
D. Acquisition Strategy			
N/A			
E. Performance Metrics			
N/A			

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide / BA 3: Advanced Technology Development (ATD)</i>					R-1 Program Element (Number/Name) PE 0603527D8Z / <i>Retract Larch</i>							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	319.698	164.544	160.762	159.688	-	159.688	162.759	165.414	168.408	171.982	Continuing	Continuing
527: <i>Retract Larch</i>	319.698	164.544	160.762	159.688	-	159.688	162.759	165.414	168.408	171.982	Continuing	Continuing

A. Mission Description and Budget Item Justification

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

B. Program Change Summary (\$ in Millions)	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020 Base</u>	<u>FY 2020 OCO</u>	<u>FY 2020 Total</u>
Previous President's Budget	171.120	161.128	160.143	-	160.143
Current President's Budget	164.544	160.762	159.688	-	159.688
Total Adjustments	-6.576	-0.366	-0.455	-	-0.455
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-6.246	-			
• FFRDC Reduction	-0.330	-0.366	-	-	-
• Other Program Adjustments	-	-	-0.455	-	-0.455

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 3					R-1 Program Element (Number/Name) PE 0603527D8Z / <i>Retract Larch</i>				Project (Number/Name) 527 / <i>Retract Larch</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
527: <i>Retract Larch</i>	319.698	164.544	160.762	159.688	-	159.688	162.759	165.414	168.408	171.982	Continuing	Continuing
A. Mission Description and Budget Item Justification This program is reported in accordance with Title 10, United States Code, Section 119(a)(1) in the Special Access Program Annual Report to Congress. For further information, please contact the Principal Deputy, Director of Defense for Research and Technology, in the Office of the Under Secretary of Defense for Research and Engineering.												
B. Accomplishments/Planned Programs (\$ in Millions)										FY 2018	FY 2019	FY 2020
Title: Retarct Larch Description: Information is classified. FY 2019 Plans: Information is classified. FY 2020 Plans: Information is classified. FY 2019 to FY 2020 Increase/Decrease Statement: Internal adjustments.										164.544	160.762	159.688
Accomplishments/Planned Programs Subtotals										164.544	160.762	159.688
C. Other Program Funding Summary (\$ in Millions) N/A Remarks D. Acquisition Strategy N/A E. Performance Metrics N/A												

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 3: Advanced Technology Development (ATD)</i>					R-1 Program Element (Number/Name) PE 0603618D8Z <i>I Joint Electronic Advanced Technology</i>							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	14.020	12.889	12.063	-	12.063	12.280	12.489	12.723	12.992	Continuing	Continuing
619: <i>EW and Non-Kinetic Effects Experimentation and Oversight</i>	-	11.770	12.114	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
245: <i>EW Enterprise Exploration and Innovation</i>	-	2.250	0.775	12.063	-	12.063	12.280	12.489	12.723	12.992	Continuing	Continuing

Note

In FY 2020, Project 619, Electronic Warfare and Non-Kinetic Effects Experimentation and Oversight, is realigned to Project 245, Electronic Warfare Enterprise Exploration and Innovation.

A. Mission Description and Budget Item Justification

The United States has enjoyed a historical technological advantage in sensors, weapons, and countermeasures. To offset this advantage, adversaries are developing competing and asymmetric capabilities that are enabled by advanced commercial electronic components and devices. These threats range from terrorist-employed improvised devices, small unmanned air systems, and easily transportable Man-Portable Air Defense Systems (MANPADS) to dedicated military systems such as advanced sensors and communications systems, advanced Electronic Warfare (EW) components and systems, integrated air defense systems (IADS), and increasingly capable cruise and ballistic missiles.

The rate at which new threats are appearing continues to accelerate and demands a faster response than traditional Department of Defense (DoD) research, development, and acquisition processes can provide. The myriad of new advanced electromagnetic spectrum (EMS) threats have made operations in the EMS significantly more difficult and complex. The challenges posed by new kinetic and nonkinetic EMS threats and the dire consequences of technology surprise highlight the need to rapidly develop and field innovative EW and EW-Cyber capabilities that can address new threats far more quickly and in more cost-effective ways.

The Joint Electronic Advanced Technology (JEAT) program is specifically designed to address these challenges through efforts designed to substantially accelerate new nonkinetic solutions for the EMS battlespace. To do this, the JEAT program explores technologies and approaches that either fall outside the Services' research and development (R&D) programs of record or are being developed at rates that cannot deliver needed capabilities in the required timeframes.

To identify nearer-term and lower-cost solutions, JEAT specifically explores and assesses approaches that use off-the-shelf military and commercial technologies in innovative ways. This approach has resulted in substantial savings for the Services and the Department in both R&D and in Programs of Record. It has also enabled needed military capabilities to be delivered to the warfighter much sooner than possible by traditional DoD approaches.

JEAT program efforts are focused in four areas in two project codes, Project 619 and Project 245.

There currently are three classes of efforts within Project 619, EW and Non-Kinetic Effects Experimentation and Oversight:

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I</i> BA 3: <i>Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603618D8Z <i>I Joint Electronic Advanced Technology</i>
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(1) Experimentation/Demonstration efforts utilize innovative field and laboratory experimentation venues to fully understand current and future threats and more rapidly and thoroughly explore, mature, and demonstrate potential countermeasures and overmatch opportunities. This effort will be realigned and funded out of the 0603699D8Z Emerging Capabilities Technology Development (ECTD) Program Element beginning in FY 2020.

(2) Advanced Technology Development/Verification efforts investigate mature technologies and approaches to counter advanced threats in innovative ways and provide powerful new warfighting capabilities. These efforts include advanced technology development of new sensors and countermeasures in laboratory environments and the development and demonstration of new warfighting capabilities such as computer-augmented data dominance and machine learning technologies and approaches to enhance EMS situational awareness and accelerate nonkinetic operations planning and decision-making. This effort will be realigned to Project 245 beginning in FY 2020.

(3) EW Collaboration and Planning ensures appropriate coordination and technological oversight of Department and Service EW and EW-Cyber R&D programs and processes and provides governance insights for senior decision-makers. This effort will be realigned to Project 245 beginning in FY 2020.

Currently the sole effort in Project 245, EW Enterprise Exploration and Innovation explores computer-augmented data dominance and machine learning technologies, tools, and approaches to enhance EMS situational awareness and accelerate nonkinetic operations planning and decision-making.

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	14.389	12.918	12.098	-	12.098
Current President's Budget	14.020	12.889	12.063	-	12.063
Total Adjustments	-0.369	-0.029	-0.035	-	-0.035
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.341	-			
• FFRDC Reduction	-0.028	-0.029	-	-	-
• Other Program Adjustments	-	-	-0.035	-	-0.035

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 3					R-1 Program Element (Number/Name) PE 0603618D8Z / Joint Electronic Advanced Technology				Project (Number/Name) 619 / EW and Non-Kinetic Effects Experimentation and Oversight			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
619: EW and Non-Kinetic Effects Experimentation and Oversight	-	11.770	12.114	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

A. Mission Description and Budget Item Justification

Project 619, EW and Non-Kinetic Effects Experimentation and Oversight explores and assesses innovative technologies and approaches to rapidly mitigate advanced threats and demonstrate new overmatch technologies in ways not being explored by the Services. Three efforts, Experimentation/Demonstration (Expt/Demo), Advanced Technology Development/Verification (ATD/V), and Electronic Warfare Enterprise Collaboration and Planning (EW C&P), focus on enabling nearer-term lower-cost technology transitions to the warfighter with reduced risk.

Expt/Demo efforts use innovative large-scale field experimentation venues to explore, demonstrate, mature, and assess innovative technologies and approaches to counter advanced electromagnetic spectrum (EMS) threats and provide new overmatch capabilities for U.S. forces. ATD/V efforts mature, integrate, and demonstrate technologies and approaches not being explored by the Services, including the use of off-the-shelf commercial and military technologies. They include laboratory efforts to demonstrate nearer-term, lower cost technological solutions to emergent threats. EW C&P efforts are conducted within the Office of the Under Secretary of Defense for Research and Engineering (OUSD(R&E)). These efforts assess, ensure coordination, and provide insights to senior leadership on all Departmental EW and EW-Cyber research and development (R&D).

Expt/Demo venues simultaneously explore myriads of technologies and approaches side-by-side with warfighter participation to more rapidly identify and mature promising technological solutions. They employ very complex and dense EMS environments, fielded and in-development threats, and emerging technologies and capabilities in combinations and ways not otherwise achievable due to cost and other limitations. These venues thus provide greater realism and far more information than any other developmental approach.

The next Expt/Demo venue, Silent Hammer (SH), is a multi-year, multi-agency, live, virtual, and constructive series of events to explore, assess, mature, and accelerate technologies and approaches for multi-platform, multi-aperture, multi-domain (M3) passive/active sensing and targeting in complex and congested EMS environments. Modeled after JEAT's highly successful BLACK DART, TRIDENT SPECTRE, Rotorcraft Aircraft Survivability Equipment Experiment (RASE), and VIGILANT HAMMER venues, SH will use both scripted and dynamic scenarios to give participants opportunities to explore new M3 capabilities and approaches to engage emerging EMS threats. Follow-on venues will address similar compelling capabilities, approaches, and threats. This effort will be realigned and funded out of the 0603699D8Z Emerging Capabilities Technology Development (ECTD) Program Element beginning in FY 2020.

ATD/V explores, matures, integrates, and demonstrates emerging technologies and approaches to address compelling EW and EW-Cyber warfighting needs. Many of these efforts are conducted in JEAT's state-of-the-art Distributed Electronic Effects Development (DEED) Laboratory to enable exploration of exceptionally complex approaches and interactions including, for example, multi-aperture collaborative-coherent EW and EW-Cyber employment using exquisitely coordinated electronic sensing and attack capabilities.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense			Date: February 2019		
Appropriation/Budget Activity 0400 / 3		R-1 Program Element (Number/Name) PE 0603618D8Z / Joint Electronic Advanced Technology	Project (Number/Name) 619 / EW and Non-Kinetic Effects Experimentation and Oversight		
EW C&P supports activities related to selecting, organizing, overseeing, and coordinating all EW and EW-Cyber-related R&D efforts across DoD. EW C&P oversees and ensures coordination and collaboration between OSD and the Joint Staff, the Combatant Commands, the Services, and the Intelligence Community (IC) on all EW and EW-Cyber activities within DoD. To accomplish this, EW C&P identifies, assesses, and develops recommendations to address EW- and EW-Cyber-related threats impacting sensors, seekers, communications, platform survivability, countermeasures, and EMS battle management. EW C&P also provides programmatic recommendations and decision support to the Office of the Under Secretary of Defense for Acquisition and Sustainment (OUSD(A&S)) on Programs of Record, Joint Urgent Operational Need responses, and similar efforts, including technology maturity and availability, critical program information standards, foreign disclosure, and technical signals requirements. EW C&P also conducts and leads deep dives and analyses of technological opportunities and advanced threats to support Departmental EW and EW-Cyber R&D research, development and acquisition efforts.					
B. Accomplishments/Planned Programs (\$ in Millions)			FY 2018	FY 2019	FY 2020
Title: Experimentation/Demonstration (Expt/Demo) Description: Leveraging JEAT's history of conducting highly successful experimentation venues, Silent Hammer (SH), our new multi-year, multi-agency, series of field experimentation venues, will explore, assess, mature, and accelerate technologies and approaches for multi-platform, multi-aperture, multi-domain (M3) passive/active sensing in complex and congested EMS environments. As with earlier Project 619 experimentation venues, Silent Hammer (SH) and subsequent venues are scoped to address the most pressing EMS threats and issues. The EW and Cyber Communities of Interest and Executive Committees and warfighters are involved in the selection of follow-on venue topics and scoping of these efforts to ensure their maximum relevance and value. FY 2019 Plans: This venue will begin exploring, assessing, and maturing technologies and approaches to engage M3 passive/active threat architectures. It will provide understanding of the effectiveness of current and new technologies in this role and any unintended consequences of simultaneous passive/active engagement. FY 2019 to FY 2020 Increase/Decrease Statement: Silent Hammer is realigned to PE 0603699D8Z, Emerging Capabilities Technology Development (ECTD), beginning in FY 2020.			6.223	6.172	-
Title: Advanced Technology Development/Verification (ATD/V) Description: ATD/V research efforts mature and assess emerging technologies to address compelling EW and converged EW-Cyber warfighting needs. They focus on identifying and integrating advanced technologies to synergistically create effects that are far greater than the sum of the constituent systems and identifying nearer term, lower cost, and more effective solutions. Many of these efforts utilize JEAT's DEED Laboratory, which integrates promising technologies into unmanned aerial vehicles for further exploration and assessment in venues like Silent Hammer. FY 2019 Plans:			1.535	1.714	-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603618D8Z / <i>Joint Electronic Advanced Technology</i>	Project (Number/Name) 619 / <i>EW and Non-Kinetic Effects Experimentation and Oversight</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
Demonstrate and assess multi-platform/multi-aperture EW and integrated Cyber/Electronic Warfare (ICEW) techniques in the laboratory. Integrate matured technologies/approaches into unmanned air systems to be flown in Silent Hammer and other experimentation venues.			
FY 2019 to FY 2020 Increase/Decrease Statement: This effort is realigned to Project 245, EW Enterprise Exploration and Innovation, within PE 0603618D8Z, Joint Electronic Advanced Technology, beginning in FY 2020.			
Title: EW Enterprise Collaboration and Planning (EW C&P)		4.012	4.228
Description: Coordinates, oversees, and manages the plethora of EMS warfare-related R&D activities in the OUSD(R&E). Maintains cognizance of all EW capabilities and capability development efforts worldwide; oversees all EW-related R&D activities across DoD; explores new and innovative EMS technologies and approaches; coordinates Departmental EW-related R&D, protocols, and policy; analyzes requisite development and operational interfaces across DoD and with international partners; and reports relevant information to senior leaders and across the Department, as well as to Congress and other external groups.			-
FY 2019 Plans: Participate in joint, collaborative EW guidance and oversight activities, including the EW EXCOM. Guide, direct, and oversee the JEAT Advance initiatives to establish EW vulnerability portfolios. Track the progress of Joint Urgent Operational Need SO-0010 (Project 619-led identification of technology solutions). Interface with the Intelligence Community (IC) to address critical intelligence gaps related to foreign EMS capabilities and advanced technology development efforts. Additional efforts include exploring a variety of new EW capabilities including battle management and visualization technologies; asymmetric targeting technologies; countermeasures to passive sensor threats; and greater leveraging of national technical means to support the development of EW and EW-Cyber capabilities.			
FY 2019 to FY 2020 Increase/Decrease Statement: This effort is realigned to Project 245, EW Enterprise Exploration and Innovation, within PE 0603618D8Z, Joint Electronic Advanced Technology, beginning in FY 2020.			
Accomplishments/Planned Programs Subtotals		11.770	12.114
C. Other Program Funding Summary (\$ in Millions) N/A			
Remarks			
D. Acquisition Strategy N/A			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603618D8Z / Joint Electronic Advanced Technology	Project (Number/Name) 619 / EW and Non-Kinetic Effects Experimentation and Oversight

E. Performance Metrics
N/A

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
245: EW Enterprise Exploration and Innovation	-	2.250	0.775	12.063	-	12.063	12.280	12.489	12.723	12.992	Continuing	Continuing
A. Mission Description and Budget Item Justification												
Project 245 was established to address compelling threats identified by the Electronic Warfare (EW) Defense Science Board in FY 2016. It originally included four efforts focused on maturing and demonstrating innovative countermeasures to new classes of advanced EW threats, demonstrating new EW-Cyber capabilities, and enabling extremely high fidelity, real-time comprehension and management control of the EMS battlespace and non-kinetic effects within it.												
B. Accomplishments/Planned Programs (\$ in Millions)									FY 2018	FY 2019	FY 2020	
Title: Non-Kinetic Battle Management and Visualization Technology Development									2.250	0.775	-	
Description: The Digital Attack Surface Execution Environment (DASEE) effort explores a variety of advanced technologies to significantly enhance the fidelity, timeliness, and comprehension of information provided to warfighters and IC analysts responsible for understanding and exercising control of the EMS and cyberspace warfighting domains. DASEE, is a joint, collaborative effort with the Services, Combatant Commands, and the Intelligence Community (IC) to integrate and demonstrate vastly enhanced real-time electromagnetic spectrum (EMS)/Cyberspace situational awareness and battle management technologies. State-of-the-art artificial intelligence, machine learning, big data analytics, and advanced heuristics will be leveraged to enable predictive analytics and course of action development and for highly accurate real-time battle management of non-kinetic capabilities within the EMS and cyberspace domains.												
FY 2019 Plans: The DASEE research effort will continue with two additional demonstrations involving progressively challenging objectives culminating with field demonstrations with operational and IC users to enable the transition of capabilities to these communities.												
FY 2019 to FY 2020 Increase/Decrease Statement: This effort continues under Advanced Technology Development/Verification (ATD/V) as described below in FY 2020.												
Title: Advanced Technology Development/Verification (ATD/V)									0.000	0.000	7.906	
Description: ATD/V research efforts mature and assess emerging technologies to address compelling EW and converged EW-Cyber warfighting needs. They focus on identifying and integrating advanced technologies to synergistically create effects that are far greater than the sum of the constituent systems and identifying nearer term, lower cost, and more effective solutions. Many of these efforts utilize JEAT's DEED Laboratory, which integrates promising technologies into unmanned aerial vehicles for further exploration and assessment in venues like Silent Hammer.												
FY 2019 Plans:												

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
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 2018	FY 2019	FY 2020
Continue demonstrating and assessing multi-platform/multi-aperture EW and integrated Cyber/Electronic Warfare (ICEW) techniques in the laboratory. Matured technology products will be integrated and flown by unmanned air systems in Silent Hammer 2 and other experimentation venues. Digital Attack Surface Execution Environment (DASEE) development efforts will also continue. FY 2020 Plans: Continue ongoing activities from FY 2019. Additional DASEE demonstrations involving progressively challenging objectives will culminate in field demonstrations with operational and IC users to enable the transition of capabilities to warfighting and IC users in FY 2020 and FY 2021. FY 2019 to FY 2020 Increase/Decrease Statement: This effort is realigned from Project 619 beginning in FY 2020.				
Title: EW Enterprise Collaboration and Planning (EW C&P) Description: Coordinates, oversees, and manages the plethora of EMS warfare-related R&D activities in the OUSD(R&E). Maintains cognizance of all EW capabilities and capability development efforts worldwide; oversees all EW-related R&D activities across DoD; explores new and innovative EMS technologies and approaches; coordinates Departmental EW-related R&D, protocols, and policy; analyzes requisite development and operational interfaces across DoD and with international partners; and reports relevant information to senior leaders and across the Department, as well as to Congress and other external groups. FY 2019 Plans: Participate in joint, collaborative EW guidance and oversight activities, including the EW EXCOM. Guide, direct, and oversee the JEAT Expt/Demo, ATD/V, and Project 245 Non-Kinetic Battle Management Technology Development efforts. Advance initiatives to establish EW vulnerability portfolios. Track the progress of Joint Urgent Operational Need SO-0010 (Project 619-led identification of technology solutions). Interface with the Intelligence Community (IC) to address critical intelligence gaps related to foreign EMS capabilities and advanced technology development efforts. Additional efforts include exploring a variety of new EW capabilities including battle management and visualization technologies; asymmetric targeting technologies; countermeasures to passive sensor threats; and greater leveraging of national technical means to support the development of EW and EW-Cyber capabilities. FY 2020 Plans: Continue ongoing activities from FY 2019. FY 2019 to FY 2020 Increase/Decrease Statement: This effort is realigned from Project 619 in FY 2020.		0.000	0.000	4.157
Accomplishments/Planned Programs Subtotals		2.250	0.775	12.063

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603618D8Z / <i>Joint Electronic Advanced Technology</i>	Project (Number/Name) 245 / <i>EW Enterprise Exploration and Innovation</i>
C. Other Program Funding Summary (\$ in Millions) N/A		
Remarks		
D. Acquisition Strategy N/A		
E. Performance Metrics N/A		

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	859.465	102.769	105.808	107.359	-	107.359	109.925	112.057	114.205	116.627	Continuing	Continuing
648: Joint Capability Technology Demonstration (JCTD)	859.465	102.769	105.808	107.359	-	107.359	109.925	112.057	114.205	116.627	Continuing	Continuing

A. Mission Description and Budget Item Justification

In alignment with the National Defense Strategy (NDS) and the DoD modernization priorities, the Joint Capability Technology Demonstration (JCTD) program conducts prototype demonstrations and experimentation to address Joint and Combatant Commands' (CCMDs) warfighting needs within two to four years of the identification of a need. The program delivers developmental and operational prototypes to the field for military utility assessment (MUA) enabling scale-up of science and technology from the laboratories into defense acquisition programs. The objective is to affordably operationalize prototyped technologies that enable warfighters to explore novel concepts and to facilitate informed transition to formal programs of record (PoR). Based on the results of the MUA, performed under the cognizance of a CCMD sponsor, the products of a JCTD are "left behind" for additional assessments or operational use, transitioned to a PoR, or returned to the technical baseline inventory for further development. The JCTD program serves as a transition bridge between the USD (R&E) and the USD Acquisition and Sustainment offices.

The key tenets of the program fulfill national objectives to build a more lethal force, strengthen alliances, and enable the Department of Defense (DoD) to achieve greater performance and affordability. Following USD(R&E) guidance, the JCTD program seeks to inform new mission capabilities for the Joint Warfighter with a focus on expediting transition timelines to meet critical challenges and operational problems. Investment for FY 2019 and beyond enables independent demonstrations and operational assessments for emerging cross-cutting technologies, including detection and tracking of hypersonic threats; hardening technology that protects systems against directed energy threats; machine learning tools that increase data processing, exploitation, and data sharing for intelligence analysts; demonstration of improved sensors for persistent wide-area surveillance in a global positioning system-denied environment; and demonstration of improved precision guided munitions that enhances missile defense and restricts enemy movements in the multi-domain environment. JCTD outcomes accelerate technology transition by rapidly evaluating technology risk, reliability, interoperability, cyber security, and manufacturing processes. Evaluating prototyped technologies in a relevant operational environment informs acquisition pathways and major acquisition program decisions prior to milestone A or B approvals.

The JCTD program achieves its objectives by engaging the Military Services, interagency, international, and non-governmental partners to expand the DoD's access to prototyping and innovation. JCTDs serve as a vehicle for CCMDs to address Joint Force strategic priority areas that present significant risk and suffer from inadequate investment. JCTDs often address technology needs that fall into the seams between the Military Services and DoD Agencies. JCTD investments are informed by the CCMDs' integrated priority list, the capability gaps assessment provided by the Joint Staff, and the Military Services' science and technology roadmaps.

In FY 2018, the JCTD program successfully completed three MUAs and transitioned three JCTD prototypes. Two JCTDs transitioned all or select components to new or existing PoRs, and one operational prototype was directly fielded and is being sustained by non-JCTD funds in theater operations.

MEASURABLE OUTCOMES:

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I</i> BA 3: <i>Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603648D8Z <i>I Joint Capability Technology Demonstration (JCTD)</i>
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A successful JCTD will transition capability for operational use. The historical transition rate for the JCTD program is 85 percent, including: 64 prototypes (55 percent) transitioning to a PoR; 31 prototypes (26 percent) providing “leave-behind” assets for operational fielding; and five prototypes (four percent) placed on the General Services Administration schedule. The remaining 17 prototypes (15 percent) were returned to the technical base for further development or were terminated. Overall, the JCTD program has directly supported multiple key operations while rapidly accelerating game changing technologies/capabilities.

<u>B. Program Change Summary (\$ in Millions)</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020 Base</u>	<u>FY 2020 OCO</u>	<u>FY 2020 Total</u>
Previous President's Budget	105.871	106.049	107.666	-	107.666
Current President's Budget	102.769	105.808	107.359	-	107.359
Total Adjustments	-3.102	-0.241	-0.307	-	-0.307
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-2.898	-			
• FFRDC Reduction	-0.204	-0.241	-	-	-
• Other Program Adjustments	-	-	-0.307	-	-0.307

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
648: Joint Capability Technology Demonstration (JCTD)	859.465	102.769	105.808	107.359	-	107.359	109.925	112.057	114.205	116.627	Continuing	Continuing

A. Mission Description and Budget Item Justification

JCTD project selection is driven by the ability to accelerate transition of new prototyped capabilities to the Joint Warfighter; strong Combatant Command and Joint Staff interest; cost share commitments from the Military Services and Defense Agencies; mature technical readiness; and a well-defined and affordable transition path for long-term sustainment. Focus areas within the current selection cycle include: joint lethality in contested environments; resilient command, control, communications, computer, intelligence, surveillance, and reconnaissance (C4ISR), and positioning, navigation, and timing; and, survivable and agile logistics. The focus areas were derived from the National Defense Strategy, the Chairman's Capability Gap Assessment, and the DoD modernization priorities. Technology areas under consideration include: detection and tracking of hypersonic threats; hardening technology that protects systems against directed energy threats; machine learning tools that increase data processing, exploitation, and data sharing for intelligence analysis; demonstration of improved sensors for persistent wide-area surveillance in a global positioning system-denied environment; and demonstration of improved precision guided munitions that enhances missile defense and restricts enemy movements in the multi-domain environment.

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 2018	FY 2019	FY 2020
Title: Low Cost Cruise Missile (LCCM)	5.000	5.000	-
Description: Previously funded JCTD. LCCM directly supports the Secretary of Defense's priority for increased lethality. LCCM provides a decentralized autonomy capability for low-cost, conventional air-launched cruise missiles that will enable joint access and maneuver in the global commons. It will be capable of conducting networked integrated attacks, in-flight dynamic retargeting/reallocation and synchronized cooperative/saturation attacks. Flight demonstrations will be conducted using surrogate weapon platforms and will provide residual leave-behind payloads for transition to a full weapon system development program. FY 2018 funds were used to produce the baseline lot of LCCM vehicles and begin flight testing. The technical manager continued the maturation and refinement of the autonomy module's ability to sense the environment and execute countermeasures.			
FY 2019 Plans: LCCM team will conduct over one hundred sorties utilizing multi-platform formations of surrogate weapons during the technical and operational demonstrations. Missions will focus on ingress formation station keeping and tactics as well as terminal area coordinated, collaborative swarm maneuvers in the presence of jamming. Pending successful operational demonstrations and			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense			Date: February 2019		
Appropriation/Budget Activity 0400 / 3		R-1 Program Element (Number/Name) PE 0603648D8Z / <i>Joint Capability Technology Demonstration (JCTD)</i>		Project (Number/Name) 648 / <i>Joint Capability Technology Demonstration (JCTD)</i>	
B. Accomplishments/Planned Programs (\$ in Millions)			FY 2018	FY 2019	FY 2020
military utility assessments, LCCM will provide residual leave-behind autonomy payloads for transition to a full weapon system development program. Complete the JCTD.					
FY 2019 to FY 2020 Increase/Decrease Statement: Project will complete in FY 2019.					
Title: Port Improvement via Exigent Repair (PIER) Description: Previously funded JCTD. PIER supports the National Defense Strategy's focus on logistics modernization and the need for resilient and agile logistics. PIER will deliver a dynamic, agile, cost effective (non-military construction) expeditionary engineering solution to rapidly repair damaged or degraded ports to a minimum level of serviceability after an attack or natural disaster. Agility is achieved through a smaller footprint, commercial off-the-shelf components, and quick reaction of theater-based repair assets (e.g., pre-packaged, pre-positioned). The intent of PIER is to assure continued logistics resiliency and freedom for U.S. Forces to maneuver and conduct agile strategic sealift and logistics. PIER will allow the Department of Defense to address the doctrine, organization, training, materiel, leadership, personnel, facility, and policy (DOTMLPF+P) concerns about its ability to conduct rapid port damage repair. FY 2018 efforts included an operational demonstration of the pile bracing/bridging and mooring technologies, and a technical demonstration on the Pier Overdecking System (PODS). These technologies allowed secondary components to strengthen the superstructure of the piers. FY 2019 Plans: PIER will conduct a final military utility assessment of technologies in cooperation with U.S. Transportation Command (USTRANSCOM), U.S. Navy, and U.S. Army. Components will transition to USTRANSCOM, U.S. Navy, and U.S. Army. Complete the JCTD. FY 2019 to FY 2020 Increase/Decrease Statement: Project will complete in FY 2019.			2.104	0.500	-
Title: Assured Command and Control using Emerging Nanosat Technology (ACCENT) Description: Previously funded JCTD. ACCENT supports the National Defense Strategy's focus on space domain defense via a modern technology solution that improves space resiliency. ACCENT places an adaptive filter algorithm into a nano-satellite receiver to mitigate radio frequency interference. ACCENT rapidly integrates the filter into a number of radios with an optional path to test in space using existing nano-satellite radios. In FY 2018, ACCENT used both JCTD and partner funds to incorporate and integrate adaptive algorithms and radio modifications to improve performance. ACCENT tested a filter-algorithm in space with the integrated communications extension capability nano-satellite constellation, and produced on-orbit test results and the military utility assessment reports. ACCENT transitioned to Navy Program Executive Office for Space Systems Science and Technology. Completed the JCTD.			0.400	-	-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
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 2018	FY 2019	FY 2020
Title: Brilliant Effects Employment Shadow (BEES) Description: Previously funded JCTD. BEES directly supports the Secretary of Defense's priority for increased lethality by enhancing the targeting kill chain. BEES will demonstrate finding, fixing, tracking, and targeting of mobile targets 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 unmanned platforms that responsively find, fix, and track moving high value targets, and update manned strike/command and control platforms. In FY 2018, BEES conducted flight demonstrations of UAS required behaviors, fight demonstrations of EW and ISR autonomous actions and laboratory testing of integrated EW and ISR payloads. FY 2019 Plans: BEES will conduct a joint military utility assessment (MUA) of autonomous EW and ISR behaviors as part of an integrated mission package in an operationally representative environment. The flight phase will conclude at the end of FY 2019. Pending successful operational demonstrations and MUA, the BEES capability will transition to a Service program of record using partner funding. FY 2019 to FY 2020 Increase/Decrease Statement: Project will complete in FY 2019.		4.000	5.000	-
Title: High-altitude Attributable Link Offset (HALO) Description: Previously funded JCTD. HALO directly supports the Department of Defense's strategic efforts to develop resilient command, control, and communications at the tactical level. HALO uses high altitude, low-cost balloons as communication relays in denied environments. It accomplished this by using the ultra-high frequency (UHF) radio frequency (RF) spectrum and techniques that provide an undisturbed and unrecognizable link to the source of the UHF signals. The advanced technology resides at the user terminals on the ground, which receive data from the balloon-platforms, and perform functions that allow effective two-way communication in a contested RF environment. In FY 2018, HALO completed laboratory testing and two operational flight-test demonstrations with several high-altitude relays against multiple jammers. HALO received procurement funds to complete the concept of operations, conduct military utility assessment, and transition to the USMC program office for production acquisition contracts. Completed the JCTD.		3.861	-	-
Title: Gunsmoke-J (Note: Name changed from Jacob's Ladder) Description: Previously funded JCTD. Gunsmoke-J supports the National Defense Strategy's focus on space domain defense via a technology approach to increase space resiliency. Gunsmoke-J uses emerging advanced electronics to allow the use of dedicated intelligence assets to provide tactically actionable targeting data to warfighters on a responsive and persistent timeline. In FY 2018, Gunsmoke-J conducted mission performance analyses while maturing the cubic satellite (CubeSat) system		2.500	-	-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
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 2018	FY 2019	FY 2020
designs and matured a data dissemination architecture. Gunsmoke-J finalized the concept of operations and evaluation plan for the military utility assessment (MUA); completed the CubeSat system assembly, integration and test work; and finalized the dissemination ground segment. The JCTD successfully conducted its critical design review, flight readiness review, and delivered four flight units to the launch provider for integration and launch. Three ground stations were installed for the MUA which was conducted by U.S. Indo-Pacific Command (USINDOPACOM) in 2018. Gunsmoke-J residuals transitioned to USINDOPACOM for operational use and sustainment. Completed the JCTD.				
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 (ISR) and fully networked command, control and communications modernization. In FY 2018, MUDLAN demonstrated resilient networking that supports high data rate communications across multiple airborne and surface platforms operating in contested environments. FY 2019 Plans: MULAN will perform flight testing on air, land, and sea platforms to demonstrate military utility of high data rate communications nodes, and demonstrate over-the-horizon, distributed communications capabilities at scale. FY 2020 Plans: MUDLAN will incorporate and demonstrate a spectrum agility capability to autonomously shift frequency bands to ensure continuous air, land, and sea connectivity in contested electronic warfare environments. MUDLAN will transition the technologies to a U.S. Air Force Air Combat Command program of record. Complete the JCTD. FY 2019 to FY 2020 Increase/Decrease Statement: Funding decreases in FY 2020 because the primary design, testing, and integration will have concluded. Operational testing and transition efforts will be supported by increased funding from partner organizations.		2.800	2.600	1.500
Title: Predictive Human Intelligence (HUMINT) Crisis Model (PICK'EM) Description: Previously funded JCTD. PICK'EM addresses capability needs identified in the U.S. Special Operations Command (USSOCOM) and U.S. Africa Command (USAFRICOM) integrated priority lists. PICK'EM will leverage machine learning and cognitive computing to provide USSOCOM, USAFRICOM, and the Defense Intelligence Agency (DIA) the capability to forecast crisis events, provide courses of action, and identify operational candidates to carry out missions in support of joint warfighters. In FY 2018, PICK'EM delivered a prototype test bed, source code, and data sets. PICK'EM started to ingest live data from multiple sources and conducted system level testing, security validation, and system accreditation. PICK'EM also delivered an operational prototype that used live scenarios.		3.000	3.800	-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense			Date: February 2019		
Appropriation/Budget Activity 0400 / 3		R-1 Program Element (Number/Name) PE 0603648D8Z / <i>Joint Capability Technology Demonstration (JCTD)</i>		Project (Number/Name) 648 / <i>Joint Capability Technology Demonstration (JCTD)</i>	
B. Accomplishments/Planned Programs (\$ in Millions)			FY 2018	FY 2019	FY 2020
FY 2019 Plans: PICK'EM will validate its prototype using live scenarios. After operational demonstrations, an independent assessor will conduct a military utility assessment. PICK'EM will transition to the DIA, USSOCOM, and USAFRICOM.					
FY 2019 to FY 2020 Increase/Decrease Statement: Project will complete in FY 2019.					
Title: Pseudolite Synthetic Aperture Radar (PSAR) Description: Previously funded JCTD. PSAR supports the National Defense Strategy's focus on command, control, communications, computers, intelligence, surveillance and reconnaissance (ISR). PSAR will mature a small form-factor synthetic aperture radar (SAR) to provide all weather ISR from a high altitude (pseudolite) platform. The small light low power system will provide high ground resolution. The PSAR capability will be demonstrated on a high altitude long endurance (HALE) unmanned aerial system. In FY 2018, PSAR designed and fabricated antennas and power amplifiers for two SAR prototypes; repackaged prototypes to meet the HALE size, weight, power and cooling constraints; and, integrated a down-link communications system for transfer of SAR data. FY 2019 Plans: PSAR will fly prototypes on a surrogate manned aircraft; complete integration of SAR prototypes on a pseudolite aircraft; and conduct technical and operational demonstrations, and military utility assessment. A fully operational capability will transition to U.S. Navy Program Executive Office, Space. Complete the JCTD. FY 2019 to FY 2020 Increase/Decrease Statement: Project will complete in FY 2019.			1.750	0.971	-
Title: Quickstrike MK64 – Extended Range (QS64-ER) Description: Previously funded JCTD. QS64-ER supports the National Defense Strategy's focus to enhance joint lethality in contested environments. QS64-ER will provide U.S. Indo-Pacific Command a low-cost wing kit and munitions guidance package to allow for the delivery of maritime mines to a precise location, from a safe stand-off distance. In FY18, QS64-ER conducted aircraft integration and verified airworthiness of the QS-ER mine, and successfully demonstrated a flight test of a baseline prototype. FY 2019 Plans: QS64-ER will conduct a demonstration from a B-52, assess mine survivability, conduct a military utility assessment and transition to the U.S. Navy Program Manager, Ships (PMS-495). FY 2019 to FY 2020 Increase/Decrease Statement:			3.250	2.567	-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603648D8Z / <i>Joint Capability Technology Demonstration (JCTD)</i>	Project (Number/Name) 648 / <i>Joint Capability Technology Demonstration (JCTD)</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
Project will complete in FY 2019.			FY 2020
Title: Semi-Automated Counter-Propaganda Platform (SCP) Description: Previously funded JCTD. SCP addresses capability needs identified in the U.S. Central Command (USCENTCOM), U.S. Special Operations Command (USSOCOM) and U.S. Southern Command (USSOUTHCOM) integrated priority lists and directly responds to a task for this capability in the National Defense Authorization Act for 2016. SCP will provide USCENTCOM, USSOCOM, USSOUTHCOM, and U.S. Indo-Pacific Command the ability to conduct critical military information support operations (MISO) at an unparalleled scale. In FY 2018, SCP conducted two technical demonstrations and delivered the SCP concept of operations, and the SCP training documentation. USCENTCOM conducted a military utility assessment and completed the JCTD. SCP transitioned to the MISO component within USSOCOM that provides support functions to all Combatant Commanders.		3.000	-
Title: Talon Tactical Mobile Over-the-Horizon Radar (TACMOR) Description: Previously funded JCTD. Talon TACMOR will support air and maritime domain awareness over the Western Pacific region. The project will demonstrate a sub-scaled over-the-horizon radar (OTHR) that is one quarter the size of traditional OTHR systems. In FY 2018, Talon TACMOR developed a system integration laboratory to test operational code based on foreign partner algorithms. In FY 2019, Talon TACMOR will conduct an operational demonstration of the radar and complete the JCTD. Talon TACMOR will use partner funds to complete transition in FY 2020 to a U.S. Air Force program of record.		3.500	-
Title: Wingman Description: Previously funded JCTD. Wingman supports the National Defense Strategy's focus on advanced autonomous systems and forward force maneuver. Wingman will project lethality by utilizing unmanned ground vehicles (UGVs) that can maneuver effectively with a mounted formation and engage ahead of and along with manned platforms. The integration of weaponized UGVs into combat elements will provide initial operational stand-off for manned vehicles, enhanced situational awareness, and mitigate the risk of casualties at first contact. In FY 2018, Wingman conducted an operational demonstration of the first unmanned system certified on the U.S. Army table VI scout gunnery course. FY 2019 Plans: Wingman will conduct a final military utility assessment of maneuver operations and Wingman technologies in cooperation with the U.S. Central Command and U.S. Army. Wingman will transition components to Product Manager, U.S. Army Applique and Large Unmanned Ground Systems (PM USA ALUGS); Program Executive Officer, U.S. Marine Corps Land Systems; and, U.S. Army Research, Development, Engineering Command. Complete the JCTD. FY 2019 to FY 2020 Increase/Decrease Statement:		3.000	3.000
			-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense			Date: February 2019		
Appropriation/Budget Activity 0400 / 3		R-1 Program Element (Number/Name) PE 0603648D8Z / <i>Joint Capability Technology Demonstration (JCTD)</i>		Project (Number/Name) 648 / <i>Joint Capability Technology Demonstration (JCTD)</i>	
B. Accomplishments/Planned Programs (\$ in Millions)			FY 2018	FY 2019	FY 2020
Project will complete in FY 2019.					
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 advantages in austere locations and the Under Secretary of Defense, Research and Engineering's modernization priority for fully networked command, control and communications. AAIRDUCT will integrate and demonstrate multiple low-cost software enhancements into an autonomous precision aerial dispersion system capable of precisely delivering sensors, unmanned ground vehicles (UGV), munitions, humanitarian aid, and equipment into urban environments to reach isolated personnel. In FY 2018, AAIRDUCT completed the final design of the airdrop Multi-Use Aerial Dispersing System. FY 2019 Plans: AAIRDUCT will conduct a military utility assessment; finalize concepts of operation and tactics techniques and procedures; and update mission planning software to address urban operations. AAIRDUCT will transition the airdrop technology to Joint Precision Aerial Delivery System Ultra Lightweight programs of record (PoRs); the dispersion system to U. S. Army Special Operations Command Military Information Support Operations PoR; and UGV/Sensor PoR for autonomous emplacement. Complete the JCTD. FY 2019 to FY 2020 Increase/Decrease Statement: Project will complete in FY 2019.			2.200	1.400	-
Title: Dialable Effects Munition (DEM) Description: Previously funded JCTD. DEM supports the National Defense Strategy's focus to enhance joint lethality in contested environments. DEM will provide U.S. Central Command and U.S. European Command the capability to modify munition effects while in flight to either increase a munition's effect on target or to lessen the effect for reduced collateral damage across a wide variety of targets. In FY 2018, DEM designed subsystem technologies and the systems integration plan for a full-scale prototype, designed the preliminary review of the DEM system, and pre-planned the options for a military utility assessment (MUA). FY 2019 Plans: DEM will perform the critical design review of the system, commence initial fabrication of the full-scale prototype, conduct ground tests, complete flight tests for inert and live prototypes, and conduct a readiness review. Upon successful completion of the DEM MUA, the government owned technical data package and test data will be transitioned to the U.S. Air Force Direct Attack Weapons Branch. FY 2019 to FY 2020 Increase/Decrease Statement:			6.484	2.460	-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603648D8Z / <i>Joint Capability Technology Demonstration (JCTD)</i>	Project (Number/Name) 648 / <i>Joint Capability Technology Demonstration (JCTD)</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
Project will complete in FY 2019.			FY 2020
Title: HYDRA Description: Previously funded JCTD. HYDRA supports the National Defense Strategy's focus to enhance forward force maneuver and posture resilience, as well as joint lethality in contested environments. HYDRA will provide U.S. Central Command and U.S. European Command the capability to deliver payloads from an undersea platform. HYDRA adapts the Defense Advanced Research Projects Agency's Hydra system and Office of Naval Research technologies to solve a Combatant Command capability shortfall, and will mature command and control capabilities to deliver the desired payload from an unmanned system. In FY 2018, HYDRA delivered a draft of the concept of operations, initial technical data packages and a prototyped payload capsule. FY 2019 Plans: HYDRA will deliver a final concept of operations, final technical data packages, a command and control package, begin building a prototype launch platform with an undersea launch capability, and a military utility assessment. FY 2019 to FY 2020 Increase/Decrease Statement: Project will complete in 2019.		3.000	4.000
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 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 2018, Under C-WOLF began maturing the AWI and ATW systems. Commenced testing and laboratory demonstrations. FY 2019 Plans: Under C-WOLF will continue maturation of the AWI and ATW systems; formulate AWI and ATW concept of operations; and acquire hardware for test demonstrations and AWI system demonstration. FY 2020 Plans:		3.350	3.250
			0.800

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Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603648D8Z / <i>Joint Capability Technology Demonstration (JCTD)</i>	Project (Number/Name) 648 / <i>Joint Capability Technology Demonstration (JCTD)</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
Under C-WOLF will deliver the AWI system for operational testing in relevant environment; complete the AWI platform integration; conduct laboratory testing of the ATW system; and perform operational demonstration. Under C-WOLF will transition capabilities to the U.S. Navy Program Executive Office Command, Control, Communications, Computers, and Intelligence.				
FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 to FY 2020 funds decrease as the capabilities begin to transition to the U.S. Navy Program Executive Office Command, Control, Communications, Computers, and Intelligence.				
Title: Combatant Commander (CCMD) Support, Capability Transition and Strategic Project Operational Management Description: Previously funded effort. This effort is comprised of three programs that support the entire JCTD Program. The three programs are (1) CCMD direct liaison support, (2) JCTD pre-transition and (3) Program Integration Office for execution of select, classified projects. (1) CCMD direct liaison support: The CCMDs are essential in specifying capability needs, project identification, demonstration venues, military utility assessment, and transition of JCTDs. The JCTD program provides direct support to CCMDs enabling them to provide an on-site JCTD operational manager. (2) JCTD pre-transition: In some cases, Service or Agency partner transition funding is not available for one to two years following the JCTD demonstration phase. In such cases, where there is a clear transition and the need to sustain the capability for a short time prior to availability of Service or Agency transition funds, the JCTD pre-transition funds may be used to meet that need. (3) Program Integration Office: Executes a select number of highly classified projects in areas such as electronic miniaturization, electronic countermeasures, advanced mobile ad hoc network communications, space situational awareness intelligence surveillance and reconnaissance, sensor platforms and communications, and persistence surveillance. FY 2019 Plans: Provide CCMD direct participation to enable CCMD staff participation in identifying and executing developmental and operational prototypes. Identify and execute projects selected by the technology assessment panels. Sustain selected projects until program of record funds are received. Execute a limited number of classified projects' military utility assessments. FY 2020 Plans: Provide CCMD direct participation to enable CCMD staff participation in identifying and executing developmental and operational prototypes. Identify and execute projects selected by the technology assessment panels. Sustain selected projects until program of record funds are received. Execute a limited number of classified projects' military utility assessments. FY 2019 to FY 2020 Increase/Decrease Statement: Slight increase from FY 2019 to FY 2020 is due to inflation of multi-year contracts.		19.522	21.083	22.000
Title: Enabling Technologies (ET)		3.000	5.000	5.000

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B. Accomplishments/Planned Programs (\$ in Millions)			FY 2018	FY 2019	FY 2020
<p>Description: The ET funds are used to assess or mature emerging capabilities that support the initiation of a developmental or operational prototype. ET investments are small (average less than \$0.500M), short (less than one year) efforts that may lead to a JCTD prototype, depending on the final assessment and determination of technical maturity. Examples of ETs funding in FY 2018 include: 1) The Autonomous Mission Package Planning and Execution (AMPPE) ET, a risk reduction effort for a set of autonomy-focused JCTDs. AMPPE demonstrated a baseline system with the ability to mission plan and conduct distributed cognitive networked electronic warfare and intel-surveillance-reconnaissance (ISR) missions using multiple unmanned aerial systems. This set a foundation for the Brilliant Effects Employment Shadow (BEES), Low-Cost Cruise Missile (LCCM) and Resilient Autonomy JCTDs. 2) Scanning Infrared Sensor for Unmanned Air Vehicle Detection and Tracking (SISUDT), a prototype fixed-site, multi-sensor counter-unmanned aerial system (C-UAS) to detect, track, and identify group one and two UASs near forward operating bases. One SISUDT prototype was deployed in support of OPERATION INHERENT RESOLVE for an in-theater validation of infrared UAS detection. As a result, the U.S. Air Force funded the operation of two SISUDT prototypes in theater. 3) IMEA (acronym is classified): Matured and manufactured a new unmanned aerial system airframe to address significant Warfighting gaps (details are classified). Began a risk reduction effort to ensure manufacturing standards and requirements are in place for the initial airframe prototype.</p> <p>FY 2019 Plans: Projects will continue to be used to assess or mature emerging capabilities that support the initiation of developmental or operational prototypes. Selected efforts will be small, focused, and executable in less than one year and require a deliverable prototype hardware and/or software, integrated subsystem or technology assessment report. Selection of ETs will be informed by the technical assessment panels that evaluate each new JCTD proposal.</p> <p>FY 2020 Plans: Projects will continue to be used to assess or mature emerging capabilities that support the initiation of developmental or operational prototypes. Selected efforts will be small, focused, and executable in less than one year and require a deliverable prototype hardware and/or software, integrated subsystem or technology assessment report. Selection of ETs will be informed by the technical assessment panels that evaluate each new JCTD proposal.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: No change in funding profile.</p>					
<p>Title: JCTD Concept Development/Developmental and Operational Prototypes</p> <p>Description: Continually funded effort. This funding allocation is used to provide funding for the new start JCTDs. The JCTD program will select projects as developmental and operational prototypes in alignment with the DoD's modernization priorities. Senior representatives from each Combatant Command, Service and Joint Staff participate in the review and selection of JCTDs. Selected projects will leverage networks within the global research and engineering enterprise to include government labs and</p>			0.000	25.680	56.168

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Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603648D8Z I Joint Capability Technology Demonstration (JCTD)	Project (Number/Name) 648 I Joint Capability Technology Demonstration (JCTD)		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
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. The JCTD office will work with the Services to identify means to streamline prototype transition into the acquisition systems where appropriate.				
FY 2019 Plans: Select advanced prototyping activities as new starts in FY 2019 in the following three(3) focus areas: - Joint lethality in contested environments: Develop means to enable the Joint Force to strike diverse targets inside adversary air and missile defense networks to destroy mobile power-projection platforms. This includes capabilities that enhance long range and close combat lethality in complex terrain. - Resilient C4ISR and positioning, navigation, and timing: Mature and maintain resilient, survivable, networks and information systems. Investments will focus on gaining and exploiting information, denying competitors those same advantages through kinetic and non-kinetic means, and defending the Joint Force while holding accountable state or non-state actors during cyberattacks. - Survivable and agile logistics: Enabling prepositioned forward stocks and munitions, strategic mobility assets, partner and allied support, as well as non-commercially dependent distributed logistics and maintenance to ensure logistics sustainment while under persistent multi-domain attack. These focus areas may be updated based on evolving Combatant Commanders' needs.				
FY 2020 Plans: Fund the follow-on efforts for projects started in FY 2019. Select advanced prototyping activities as new starts in FY 2020 that support the National Defense Strategy and the Under Secretary of Defense for Research and Engineering (USD(R&E)) priorities.				
FY 2019 to FY 2020 Increase/Decrease Statement: Program Element baseline show an increase from FY 2019 to FY 2020. This line is dedicated to new start projects. During the years of execution (FY 2018 / FY 2019), once projects are selected, funding is no longer accounted in this line and is accounted for in projects detailed separately throughout the R-2A. The reality is that total funding supporting new start projects remains constant at approximately 30 present of the annual appropriation.				
Title: Expedient and Expeditionary Airfield Damage Repair (E-ADR)		2.000	2.000	2.000
Description: FY 2018 new-start JCTD. E-ADR supports the National Defense Strategy's focus on resilient agile logistics and forward force maneuver. E-ADR will provide an expeditionary low-logistics repair capability that maximizes the use of indigenous materials and readily available equipment. E-ADR will provide an expedient repair capability for aircraft runways in austere and dynamic base locations. In FY 2018, E-ADR conducted technical testing, model development, and tactics, techniques, and procedures (TTP) development.				
FY 2019 Plans:				

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
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 2018	FY 2019	FY 2020
E-ADR will conduct technical and operational demonstrations for model validation; runway repair quality assessment; and, damaged surface cutout and removal. FY 2020 Plans: E-ADR will refine TTP, conduct an operational demonstration, and conduct a final military utility assessment of surface capping and crater fill material processing, placement, and compaction. E-ADR will transition low-equipment count kits optimized for expeditionary transport along with validated TTP to U.S. Air Force Silver Flag sites and Naval Construction Groups via U.S. Air Force Civil Engineer Center, U.S. Air Force Life Cycle Management Center, Naval Facilities Command and Naval Expeditionary Combat Command. FY 2019 to FY 2020 Increase/Decrease Statement: There is no funding change from FY 2019 to FY 2020.				
Title: Electromagnetic Spectrum - Visual Instance of the Environment for Warfighters (EMS-VIEW) Description: FY 2018 new-start JCTD. EMS-VIEW supports the National Defense Strategy's focus on deepening interoperability and innovative operational concepts. EMS-VIEW provides a joint enterprise framework for Services to share situational awareness, collaboratively plan, and decentralize decision making. EMS-VIEW's first generation framework allows for reliable electromagnetic spectrum (EMS) access and EMS freedom of maneuver for offensive and defensive operations in a multi-domain environment. In FY 2018, EMS-VIEW drafted the project reference architecture, built DoD architecture framework views, identified software services, defined database interfaces, authored an implementation guide, and finalized the technical and operational demonstration plans. FY 2019 Plans: EMS-VIEW will design, integrate, and demonstrate software services and conduct its final demonstration. Upon completion of the military utility assessment, EMS-VIEW will transition the capabilities to the U.S. Marine Corps' Spectrum Services Framework program, the U.S. Army's Electronic Warfare Planning and Management Tool program, and the DoD's Defense Spectrum Office's Global Electromagnetic Spectrum Information System program. FY 2019 to FY 2020 Increase/Decrease Statement: Project will complete in 2019.		1.081	1.264	-
Title: Joint Negation of Asymmetric Threats (JNAT) Description: FY 2018 new start JCTD. JNAT supports the National Defense Strategy's focus on innovative operational concepts to deny enemy freedom of action. JNAT uses an adaptable plug and fight architecture that leverages existing applications to create a second generation counter unmanned aerial system (C-UAS) architecture. This system-agnostic architecture integrates a variety of sensors to be adaptably employed against evolving UAS threats, particularly in the U.S. Indo-Pacific Command, U.S.		3.808	1.850	2.767

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<p>Africa Command (USAFRICOM), and U.S. Northern Command areas of responsibility. JNAT received partner funds from the U.S. Air Force, U.S Army, U.S. Navy, and USAFRICOM. In FY 2018, JNAT tested a system architecture with radar and negation tools to conduct the first technical demonstration for UAS target detection and tracking.</p> <p>FY 2019 Plans: JNAT will conduct its operational demonstration with multiple radar systems and high power microwave systems, while demonstrating kinetic and non-kinetic negation options. JNAT will develop a C-UAS concept of operations and demonstrate a common operating picture and reporting tool.</p> <p>FY 2020 Plans: JNAT will conduct a cyber-negation demonstration; demonstrate a leave behind integrated air defense and point defense capability; baseline adaptable C-UAS architecture; and conduct the final military utility assessment. JNAT will transition to the U.S. Navy, the U.S. Air Force Life Cycle Management Center, and the U.S Army Aviation and Missile Research, Development and Engineering Center.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 to FY 2020 funds increase to enhance prototype C-UAS architecture with additional capabilities prior to the military utility assessment.</p>				
<p>Title: More Situational Awareness for Industrial Control Systems (MOSAICS)</p> <p>Description: FY 2018 new start JCTD. MOSAICS supports the National Defense Strategy's focus on cyber space domain defense and improved posture resilience and cybersecurity modernization. MOSAICS will provide cyber defense for supervisory industrial controls of critical warfighting infrastructure. MOSAICS will provide the ability to semi-autonomously detect, analyze, visualize, mitigate and recover from asymmetric attacks on critical infrastructure industrial controls in mission relevant timeframes. In FY 2018, MOSAICS conducted technology development in a lab environment, validated system interfaces and protocols, drafted a concept of operations (CONOPS), and began demonstrations.</p> <p>FY 2019 Plans: MOSAICS will provide a fully integrated end-to-end prototype, conduct initial field demonstrations, and deliver advanced cyber industrial control systems tactics techniques, and procedures.</p> <p>FY 2020 Plans:</p>		1.650	1.300	2.040

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
MOSAICS will conduct operational demonstrations and deliver leave-behind operational prototypes, validated CONOPS, training packages, and Unified Facilities Criteria. After the military utility assessment (MUA), MOSAICS will transition to U.S. Navy Naval Facilities Engineering Command for sustainment. Complete the JCTD.				
FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 to FY 2020 increase is based on higher cost of executing multiple operational demonstrations and conducting the MUA.				
Title: Automating Indications and Warnings (I&W) for Operational Awareness (REDLINE)		3.000	3.000	4.000
Description: FY 2018 new start 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 Combatant Commands the ability to conduct automated order of battle tracking of adversary conventional and grey zone forces in denied areas. In FY 2018, REDLINE provided the initial capability for vetted alerts to facilitate real-time tracking and mobilization I&W on the Joint Worldwide Intelligence Communications System. Details are classified.				
FY 2019 Plans: REDLINE will deliver improved algorithms and a fully automated dissemination of highest confidence alerts as assessed by calibrated performance models. The REDLINE system will deploy on the Secret Internet Protocol Router Network.				
FY 2020 Plans: REDLINE will scale performance to support global event detection and classification and provide open applications programming interfaces to facilitate interoperability with other systems. After the military utility assessment, REDLINE will transition to the Defense Intelligence Agency's Foundational Intelligence Modernization effort as a program of record. Complete the JCTD.				
FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 to FY 2020 increase is based on higher cost of conducting multiple operational demonstrations and activities required for transition.				
Title: Resilient Autonomy (RA)		3.803	3.689	2.505
Description: FY 2018 new start 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 2018, RA conducted architecture development, integration and baseline system testing and evaluation. RA worked with the Federal Aviation Administration (FAA) to identify metrics required for RA flight certification and detailed FAA required milestones.				

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense			Date: February 2019		
Appropriation/Budget Activity 0400 / 3		R-1 Program Element (Number/Name) PE 0603648D8Z / <i>Joint Capability Technology Demonstration (JCTD)</i>		Project (Number/Name) 648 / <i>Joint Capability Technology Demonstration (JCTD)</i>	
B. Accomplishments/Planned Programs (\$ in Millions)			FY 2018	FY 2019	FY 2020
FY 2019 Plans: RA will complete integration of RA capabilities into the HQ-90 UAS; conduct technical demonstrations, and perform test and evaluation of the integrated capability package.					
FY 2020 Plans: RA will conduct an operational demonstration of autonomous flight in civilian airspace using detect and avoid technologies to ensure safe separation from other aircraft or obstructions. A rigorous military utility assessment (MUA) will be conducted and FAA certification process completed. RA will transition the RA capabilities to a United States Marine Corps Unmanned Aerial System program of record.					
FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 to FY 2020 funding decreases because the majority of hardware and technology development will be completed in the previous year. Funds in FY 2020 will primarily be used to support the operational demonstration and the MUA.					
Title: Special Advanced Low-cost Surveillance Alternative (SALSA)			1.570	0.820	0.004
Description: FY 2018 new start JCTD. SALSA supports the National Defense Strategy's focus on resilient command, control, communications, computers, intelligence, surveillance and reconnaissance and missile defense modernization. SALSA will demonstrate an operational, affordable prototype sensor that provides on-demand, persistent wide-area surveillance for the Arctic environment. In FY 2018, SALSA designed and manufactured a baseline radar system and delivered an operational prototype for execution of technical and operational demonstrations.					
FY 2019 Plans: Select site for the SALSA operational demonstration (OD), conduct planning and preparation for SALSA OD, finalize communications architecture for flight test; conduct OD.					
FY 2020 Plans: Conduct final OD and military utility assessment. U. S. Army Program Executive Office Missiles & Space (PEO M&S) / Cruise Missile Defense System (CMDS) will provide integration partnering with Aviation and Missile Research Development and Engineering Center for transitioning of capability. Complete the JCTD.					
FY 2019 to FY 2020 Increase/Decrease Statement: Technical demonstrations completing in FY 2019. Minimal funding required in FY 2020 for transition of the capability.					
Title: STRIKE-X Launched ATACMS from Ship (SLASh)			4.125	1.775	1.625
Description: FY 2018 new start JCTD. SLASh supports the National Defense Strategy's focus on joint lethality in contested environments. SLASh will provide a sea launch option for the Army Tactical Missile System (ATACMS). The JCTD will					

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>demonstrate a long range supersonic ballistic surface to surface missile for employment by Expeditionary Strike Groups (ESGs), logistic forces and U.S. Army (USA) watercraft. In FY 2018, SLASH completed engineering design plans for shipboard blast pad; formulated baseline design work for ATACMS software modifications; scheduled the test range and ship and completed test launch planning.</p> <p>FY 2019 Plans: SLASH will complete the ATACMS software modification; conduct software validation and verification; conduct fabrication and qualification testing of shipboard blast pad; perform validation of launcher control system adaptability for shipboard use; request launch planning, safety and environmental approvals; request ship alteration and approval for T-ESB class ships; and conduct missile requisition and integration with High Mobility Artillery Rocket System (HIMARS) launcher.</p> <p>FY 2020 Plans: SLASH will seek launch approval from the Weapon System Safety Evaluation Review Board (WSSERB); and, test launch from a HIMARS launcher on a T-ESB class ship against a land target in a test range. Upon successful demonstration, SLASH will transition to the US Army, Program Executive Office, Missiles and Space (PEO M&S), ATACMS' program of record.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 to FY 2020 decrease is based on higher cost of development activities occurring in the first year of effort.</p>			
<p>Title: Unmanned Logistics System-Air (ULS-A)</p> <p>Description: FY 2018 new-start JCTD. ULS-A supports the National Defense Strategy's focus on resilient agile logistics, advanced autonomous systems, and machine learning modernization. ULS-A will demonstrate the utility of unmanned aerial system (UAS) prototypes coupled with autonomous technologies to provide an organic, highly autonomous aerial distribution capability that increases ground maneuver force agility, decreases carrying load, and allows the Joint Commanders to have 'on-call' control of mission essential and time-critical resupply. In FY 2018, ULS-A conducted initial prototype acquisition, and small and medium ULS-A autonomy technical demonstrations.</p> <p>FY 2019 Plans: ULS-A will incorporate medium ULS-A prototype improvements, integrate autonomy algorithms and conduct a technical demonstration for medium ULS-A.</p> <p>FY 2020 Plans: ULS-A will conduct an operational demonstration of an upgraded autonomy package and UAS advanced capabilities; finalize capability development document (CDD) for Service review; complete medium ULS-A joint concept of operations; and conduct final military utility assessment. ULS-A will transition the small ULS-A operational prototype initial capability document (ICD) to U.S. Navy's Naval Air Systems Command (NAVAIRSYSCOM) program office. Medium ULS-A operational prototype will transition</p>		6.011	3.799
			6.950

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
to a U.S. Army and/or NAVAIRSYSCOM program office to inform a Milestone B decision in FY 2022. Medium ULS-A capabilities description document and concept of operations will transition to Services fielding ULS-A.			
FY 2019 to FY 2020 Increase/Decrease Statement: Funding increases in FY 2020 due to final integration, testing, operational assessment, and transition costs of both small and medium ULS-A platforms.			
Accomplishments/Planned Programs Subtotals		102.769	105.808
C. Other Program Funding Summary (\$ in Millions) N/A			
Remarks			
D. Acquisition Strategy Successful JCTDs can transition to acquisition via one of several methods: <ul style="list-style-type: none"> - The JCTD addresses a documented capability gap in an existing program of record (PoR). The existing PoR can acquire, further mature, sustain, and provide the capability under existing program documentation. - The capabilities address capability gaps that naturally fit with an existing PoR, but program documentation addressing the new capabilities does not exist. In these cases, existing PoR documentation (such as the capabilities development document (CDD) or capabilities production document (CPD)) is revised to include the new capabilities from the JCTD, and the JCTD capabilities transition to the PoR. - The capabilities address a current operational need without requiring PoR changes. In these cases, the JCTD capabilities may transition directly to operational use, with sustainment (operations and maintenance) funding arranged through the gaining command. - The Results of JCTD can be used to inform research and engineering, or validate a joint requirement per the Joint Capabilities Integration and Development System. This includes identification of the need through development of an initial capability description (ICD) document or accelerating the development of a CDD or CPD to establish a new PoR. - The capabilities may be widely applicable commodity products, useful to many commands. In these cases, the commodity products are listed on General Services Administration schedule, and made available for purchase by any commands needing the capability. 			
E. Performance Metrics Strategic Goals Supported: <ul style="list-style-type: none"> - Mature and demonstrate a prototype that fills a joint capability gap. - Demonstrate a capability to address a DoD key strategic gap. - Demonstrate a prototype that informs the acquisition and requirements process. - Conduct an independent technology risk assessment. - Successful military utility assessment. 			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
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)
<p>MEASURABLE OUTCOMES:</p> <p>JCTDs demonstrate capability objectives within 24-48 months. The JCTD program continues to assess transition. In FY 2018, 100 percent of completed prototypes successfully transitioned and exceeded the DoD strategic performance goal of 40 percent. Two of three completed prototypes transitioned all or select capabilities or components to a new or existing PoR. One operational prototype was directly fielded and is being sustained by non-JCTD funds in theater operations.</p>		

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	12.369	12.667	2.858	-	2.858	2.912	2.964	3.016	3.081	Continuing	Continuing
663: Network Communications Analysis	-	12.369	12.667	2.858	-	2.858	2.912	2.964	3.016	3.081	Continuing	Continuing

A. Mission Description and Budget Item Justification

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

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

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide / BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603662D8Z / <i>Networked Communications Capability</i>
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B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	12.661	12.696	2.866	-	2.866
Current President's Budget	12.369	12.667	2.858	-	2.858
Total Adjustments	-0.292	-0.029	-0.008	-	-0.008
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.268	-			
• FFRDC Reduction	-0.024	-0.029	-	-	-
• Other Program Adjustments	-	-	-0.008	-	-0.008

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
663: Network Communications Analysis	-	12.369	12.667	2.858	-	2.858	2.912	2.964	3.016	3.081	Continuing	Continuing

A. Mission Description and Budget Item Justification

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

The Future Autonomous Battlespace Radio Frequency with Integrated Communications (FABRIC) program is developing next generation communications layer architecture for tactical networks for operations in anti-access/area denial (A2/AD) threat environments. This architecture will deliver capacity and affordability to enable future smart sensors and smart weapons. The network architecture is flexible enough to support Commander's Intent in any mission, environment, operating tactical platform, and weapon system under various threat conditions. FABRIC's efforts focus on developing the advanced component technologies, such as Anti-Jam (AJ), Low Probability of Intercept(LPI), Low Probability of Detection (LPD), and Low Probability of Exploitation (LPE) waveforms; adaptive processing algorithms; adaptive antenna technologies (transmit/receive/nulling); adaptive power control; Dynamic Spectrum Access (DSA)/Dynamic Spectrum Management (DSM) techniques; self-healing mechanisms and cyber hardening; and advanced routing to ensure Quality of Service. The guiding tenets for creating this new Command, Control, Communications, Computers, & Intelligence (C4I) capability encompass enabling new missions, i.e. providing resilient tactical data links, communications and networking "service level" capabilities, interoperation, cost (affordable), and improved performance in terms of military value.

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

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
Title: Future Autonomous Battlespace RF with Integrated Communications (FABRIC)	12.369	12.667	2.858
Description: The FABRIC program develops hardware (HW), software (SW), and algorithms to advance network technologies creating a robust tactical network to operate in contested A2/AD environments. The project investigates and develops flexible, high performance, and affordable technologies for the tactical network, supporting capability changes as a mission progresses from phase to phase. The project develops and matures technologies to support direct transition of the algorithms, prototype implementations, waveform improvements, and system design improvements to radio, waveform, and weapon systems programs managed by each military department.			
FY 2019 Plans: HW and SW Development			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603662D8Z / <i>Networked Communications Capability</i>	Project (Number/Name) 663 / <i>Network Communications Analysis</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<ul style="list-style-type: none"> - Deliver Cyber Hardened Embedded and Exascale Trusted Architecture Processor (CHEETAH) processor design and fabricate through 14 nanometer trusted foundry. - Deliver full baseline software stack; validate execution speed, latency, and operational resilience of software. - Design proof of concept High Frequency (HF) capability that enables the propagation of electromagnetic waves. Design concept will address four major technology areas: software defined, wideband antennas, mesh networking, and ionosphere nowcasting. <p>Prototyping, Lab, and Field Testing</p> <ul style="list-style-type: none"> - Complete physical/low cost (with Size, weight, and power considerations) phased array prototype effort. - Design and execute lab and controlled field testing of beam forming capability at the Air Force Research Lab's Stockbridge Controlled Contested Environment site. - Design a system field testing of the network supporting links to unmanned aerial vehicle (UAV) platforms and nearby units operating in an urban/dense environment. <p>System Integration</p> <ul style="list-style-type: none"> - Complete integration of major functional system elements and HW/SW components (such as electronically steerable aperture (ESA), Radio Frequency (RF), and processing). - Construct and exercise preliminary FABRIC network for system integration and validation. - Modeling & simulation and testing of FABRIC system performance against electromagnetic pulse. <p>Scenarios and Transition Planning</p> <ul style="list-style-type: none"> - Continue to modify and mature variations of the A2/AD related scenarios to identify performance requirements and firm up transition plans - Explore dynamic mission adjustments and communication interactions with realistic multi-modality (precision-navigation-timing (PNT), electro-optical (EO), etc.) functions on various platforms. <p>FY 2020 Plans:</p> <p>HW and SW Development</p> <ul style="list-style-type: none"> - Design and fabric CHEETAH printed circuit board (PCB) with DARPA's Arrays on Commercial Timescale Multi-Chip Modules. <p>System Integration</p> <ul style="list-style-type: none"> - Software integration on PCB including beamforming, modems, networking functions. - Integration and test of PCB with the aperture. - Port and test EO and RADAR code. 			
			FY 2020

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603662D8Z / <i>Networked Communications Capability</i>	Project (Number/Name) 663 / <i>Network Communications Analysis</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>Scenarios and Transition Planning</p> <ul style="list-style-type: none"> - Continue to modify and mature variations of scenarios to assess and validate performance requirements and firm up transition plans. - Continue to explore dynamic mission adjustments and communication interactions with realistic multi-modality (PNT, EO, etc.) functions on various platforms. <p>Prototyping, Lab, and Field Testing</p> <ul style="list-style-type: none"> - Complete prototype ready for integration. - Continue planning for System Field testing of the fully prototyped network. <p><i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> FY 2019 to FY 2020 adjustments are reflective of higher priority DoD requirements.</p>			
Accomplishments/Planned Programs Subtotals		12.369	12.667
C. Other Program Funding Summary (\$ in Millions) N/A			
Remarks			
D. Acquisition Strategy The FABRIC project will address capability gaps for Joint tactical data link networks by developing the technologies that the Military can incorporate in future platform and radio acquisitions. The proposed experimentation, with field demonstrations and modeling, will increase the Technology Readiness Level (TRL) of critical technology components, suitable for transition to acquisition programs. This will also provide DoD leadership with the supporting technical and cost details to identify candidate "building blocks" for timely incremental improvements.			
E. Performance Metrics The Research, Development, Test, and Evaluation (RDT&E) goal for FABRIC is capability improvements that achieve greater than 70 percent "Buy-Back" of the tactical data link operational range and 80 percent of the area of operation lost in the A2/AD environment.			
<ul style="list-style-type: none"> - Enhanced Link Capacity: 10X-100X Faster - Enhanced Connectivity: 4X-10X Network Neighbor Connections - Enhanced Spatial/Time Filtering: 4-7 Adaptive Nulls (Scenario Dependent) - Receiver Based Mitigation: 20-30dB per Jammer Type (Scenario Dependent) - Enhanced LPI/LPD: 4X-10X Closer Range to Target with Same Percent LPI/LPD - Enhanced Network Scalability: 300-1000 nodes 			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603662D8Z / <i>Networked Communications Capability</i>	Project (Number/Name) 663 / <i>Network Communications Analysis</i>
<p>- Low cost AESA systems: <\$25K each</p> <p>Achieve significant DoD savings for radio modifications or integration into new terminals or platforms (economies of scale) as services share non-recurring development costs for common and successful TDL enhancements.</p>		

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 3: Advanced Technology Development (ATD)</i>					R-1 Program Element (Number/Name) PE 0603680D8Z / <i>Defense Wide Manufacturing Science and Technology Program</i>							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	576.107	206.257	174.489	96.397	0.000	96.397	79.543	78.423	76.965	78.469	Continuing	Continuing
680: <i>Manufacturing Science and Technology Program</i>	174.930	0.000	0.000	30.162	0.000	30.162	32.102	32.783	33.039	33.651	Continuing	Continuing
350: <i>Manufacturing Innovation Institutes</i>	401.177	206.257	174.489	66.235	0.000	66.235	47.441	45.640	43.926	44.818	Continuing	Continuing

Note

N/A

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.

The DMS&T program supports the National Defense Strategy (2018) which states a healthy defense industrial base is a critical element of U.S. power and the National Security Innovation Base. The ability of the military to surge in response to an emergency depends on our Nation's ability to produce needed parts and systems, healthy and secure supply chains, and a skilled U.S. workforce. The objective of the DMS&T program is to increase the speed of innovation and provide frequent technology off-ramp opportunities, turning inventions and scientific discoveries into actual equipment and capabilities for our men and women in uniform as quickly and affordably as possible. The DMS&T program has created and is sustaining an ecosystem that addresses near term critical technology requirements and accelerates promising technology (hypersonics, directed energy, artificial intelligence, etc.) to the warfighter via innovative manufacturing methods through a two-pronged strategy: (1) OSD Manufacturing Technology (ManTech) R&D projects and the (2) Manufacturing Innovation Institutes (MIIs).

This program also supports many of the recommendations in the Executive Order Report "Assessing and Strengthening the Manufacturing and Defense Industrial Base and Supply Chain Resiliency of the United States" September 2018.

There are two project codes in this Program Element (PE) : P680 OSD Manufacturing Technology and P350 the DoD Manufacturing USA Institutes.

P680 OSD Manufacturing Technology:

The OSD Manufacturing Technology (ManTech) program was established to address needs beyond the risk of a single Service or agency. It focuses on cross-cutting defense manufacturing needs and stimulates early development of manufacturing processes and enterprise business practices, concurrent with S&T development, to achieve the largest cost-effective impact and facilitate development of enabling capabilities for the warfighters.

P350 DoD Manufacturing USA Innovation Institutes:

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603680D8Z / <i>Defense Wide Manufacturing Science and Technology Program</i>
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This project is focused on supporting eight DoD led manufacturing innovation institutes which are part of the Manufacturing USA network of manufacturing innovation institutes. The technologies that are being pursued include (1) additive manufacturing; (2) digital manufacturing, design and manufacturing cybersecurity; (3) lightweight metals; (4) integrated photonics; (5) flexible hybrid microcircuits; (6) smart fibers and textiles; (7) advanced tissue biofabrication and; (8) advanced robots for manufacturing. Each institute is a public/private partnership that matches DoD funding at a one to one ratio or greater and has established a consortium of members from industry and academia to mature the manufacturing processes in their respective areas, to build out the ecosystems that supports these areas, and provides resources supporting advanced manufacturing education and workforce development. Through the government investment, DoD maintains strategic influence in the work accomplished by the institutes and realizes accelerated technological innovation for defense products.

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	136.159	114.637	87.647	0.000	87.647
Current President's Budget	206.257	174.489	96.397	0.000	96.397
Total Adjustments	70.098	59.852	8.750	0.000	8.750
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	75.500	60.250			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• FFRDC Reductions	-0.262	-	-	-	-
• Other Program Adjustments	-5.140	-0.398	8.750	-	8.750

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

Project: 350: Manufacturing Innovation Institutes

Congressional Add: *Manufacturing Engineering Programs*

Congressional Add: *General Increase*

Congressional Add: *Manufacturing Institutes*

Congressional Add: *National Security Technology Accelerator*

Congressional Add: *Gallium Nitride (GAN) Semiconductor Technology*

Congressional Add: *Advanced Manufacturing*

Congressional Add Subtotals for Project: 350

Congressional Add Totals for all Projects

FY 2018	FY 2019
25.000	5.000
10.000	0.000
0.000	10.250
25.000	15.000
14.738	0.000
0.000	30.000
74.738	60.250
74.738	60.250

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
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	
Change Summary Explanation The FY 2018 Congressional Add for \$75.500 million supports efforts for: Manufacturing Engineering Programs; Gallium Nitride (GAN) Semiconductor Technology; engagements in Manufacturing USA institutes; and National Security Technology Accelerator. The FY 2019 Congressional Add for \$60.250 million supports the acceleration of efforts for: manufacturing engineering programs; manufacturing innovation institutes; advanced manufacturing; and National Security Technology Accelerator. The FY 2020 increase of \$8.750 million supports activities in the Manufacturing Institute Initiatives project.		

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
680: Manufacturing Science and Technology Program	174.930	0.000	0.000	30.162	0.000	30.162	32.102	32.783	33.039	33.651	Continuing	Continuing
Note N/A												
A. Mission Description and Budget Item Justification Established to address needs beyond the risk of a single Service or Agency and to complement the Component ManTech programs, the OSD ManTech program concentrates on cross-cutting defense manufacturing needs that are beyond the ability of a single service to address and stimulates the development of manufacturing processes concurrent with S&T development to reduce total ownership cost and facilitate transition of technology to capability for our Warfighters. As a technology investment program, OSD ManTech serves its joint mission requirements by investing in enterprise wide issues with joint service applicability and seeks to enhance manufacturing capability for defense-essential/defense-unique technologies that are beyond reasonable/normal industry and program office risk. In support of this mission the OSD ManTech program invests in broad technology initiatives that support multiple systems’ requirements as well as specific individual projects meeting more focused and immediate warfighter needs. Key OSD ManTech technical areas include Advanced Electronics and Optics, Advanced Materials and Composites, Advanced and Emerging Manufacturing Processes, and Advanced Energetics Manufacturing.												
B. Accomplishments/Planned Programs (\$ in Millions)								FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Manufacturing Science and Technology Program								0.000	0.000	30.162	0.000	30.162
Description: The OSD ManTech (P680) portfolio includes a focus on above-the-shop-floor new manufacturing processes and practices having the potential to improve manufacturing efficiencies at broader, enterprise levels. Single specific projects address investment opportunities and enable the program to more surgically apply investments to compelling and sometimes urgent manufacturing needs.												
FY 2019 Plans: N/A												
FY 2020 Base Plans: • Mature ManTech tools, technology and talent capabilities and capacity into projects across Electronics, Composites, Energetics, and Manufacturing processes.												

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense				Date: February 2019		
Appropriation/Budget Activity 0400 / 3		R-1 Program Element (Number/Name) PE 0603680D8Z / <i>Defense Wide Manufacturing Science and Technology Program</i>		Project (Number/Name) 680 / <i>Manufacturing Science and Technology Program</i>		
B. Accomplishments/Planned Programs (\$ in Millions)						
		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
<ul style="list-style-type: none"> • Incorporate JDMTP, S&T, DARPA, IARPA, Service strategies, Manufacturing USA Institutes, and IPL inputs into evolving portfolio structure. • Develop best practices and relationships with industry, academia, and Service components. • New Project Starts (NDS Alignment; USD R&E Alignment) – Hypersonic RF Window Manufacturing Development (Hypersonics, Directed Energy, Joint Lethality; Hypersonics, Electronic Warfare, Directed Energy), Advanced Mixing for Infrared Countermeasures (Joint Lethality), Lightweight Hydrogen Fuel Cell (Joint Lethality, Autonomy; Electronic Warfare, Command, Control and Communications) . • Continuing Projects – Foamed Celluloid Materials (Joint Lethality), Light Weight Gradient Index Lenses (Joint Lethality), DBX-1 (Joint Lethality), Circular Polarizers for Color Day Cameras (Joint Lethality), MOC3HA (Hypersonics; Hypersonics, Missile Defense, Space Offense and Defense), Monolithic Spectral Beam Combiners (Directed Energy; Directed Energy, Electronic Warfare, Space Offense and Defense), High Density Reactive Materials (Joint Lethality). • Completing Projects – Fabrication of Non-Eroding Metallic Throat (Hypersonics; Hypersonics, Missile Defense, Space Offense and Defense), MEMS Navigation Grade Inertial Sensors (Joint Lethality; Command, Control and Communications, Microelectronics), Oxide-Oxide (Hypersonics, Joint Lethality; Hypersonics), Magnesium Oxide Binder for Thermal Batteries (Joint Lethality, Hypersonics; Hypersonics, Space Offense and Defense, Missile Defense), Stabilized Alpha Alane (Hypersonic, Joint Lethality; Hypersonics, Missile Defense). <p><i>FY 2020 OCO Plans:</i> N/A</p> <p><i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> Decrease from 52.238 to 30.162 to reflect completion of Congressional Add programs.</p>						
Accomplishments/Planned Programs Subtotals		0.000	0.000	30.162	0.000	30.162
C. Other Program Funding Summary (\$ in Millions) N/A						
Remarks N/A						
D. Acquisition Strategy Not applicable for this item. Outyear data for "Other Program Funding" is contained within the Service budgets.						

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
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

E. Performance Metrics

The majority of DMS&T investment project performance metrics are specific to each effort and include specific key performance parameters and transition/ implementation plans and metrics identified in the project plans. Typical metrics include target dates and conditions-based milestones in project work breakdown schedules, production measures, production goals, production numbers and demonstration goals and dates.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
350: Manufacturing Innovation Institutes	401.177	206.257	174.489	66.235	0.000	66.235	47.441	45.640	43.926	44.818	Continuing	Continuing
Note N/A												
A. Mission Description and Budget Item Justification DoD supports eight manufacturing innovation institutes which are public/private partnerships that address both commercial and defense manufacturing needs within specific, defense-relevant technology areas and receive active participation and support from the military departments and defense agencies. The institutes’ flexible business models and strong focus on enabling highly collaborative R&D are catalyzing important new organizational relationships across government, industry and academia. This is bringing together both traditional defense and non-traditional sectors, accelerating key innovation cycles and expanding U.S. industrial capability and assisting in creating resilient supply chains that will support innovative defense products.												
B. Accomplishments/Planned Programs (\$ in Millions)								FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: DoD Manufacturing Innovative Institutes								110.007	91.911	66.235	0.000	66.235
Description: DoD’s eight institutes are: (1) America Makes (Additive Manufacturing); (2) Digital Manufacturing and Design Innovation Institute (Digital Manufacturing, Design and Cybersecurity); (3) Lightweight and Modern Metals Manufacturing (Lightweighting Innovations – materials and processes); (4) American Institute for Manufacturing Integrated Photonics (Device Manufacturing and Packaging); (5) Flexible Hybrid Electronics Manufacturing Innovation Institute (Flexible Hybrid Electronics Manufacturing); (6) Advanced Functional Fabrics of America (Smart Fibers and Textiles); (7) Advanced Tissue Biofabrication Manufacturing Innovation Institute (regenerative tissue manufacturing); (8) Advanced Robotics Manufacturing (Smart Collaborative Robotics for Manufacturing).												
The funding provided for the manufacturing innovation institutes is focused in the following areas: • Conducting (or funding) pre-competitive applied research and development projects to reduce the cost, time, and technical uncertainty related to new manufacturing technologies and to improve existing technologies, processes, and products. • Developing and implementing education, training, and workforce recruitment courses, materials, and programs.												

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense			Date: February 2019
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603680D8Z / <i>Defense Wide Manufacturing Science and Technology Program</i>	Project (Number/Name) 350 / <i>Manufacturing Innovation Institutes</i>	

B. Accomplishments/Planned Programs (\$ in Millions)

- Developing innovative methodologies and practices for supply chain integration and introduction of new technologies into supply chains.
- Engaging with small and mid-sized manufacturers, including women and minority-owned manufacturing enterprises, and larger-sized manufacturing firms.

While each institute has a different model there are similar in the following ways;

- Each is a public-private partnership with representatives from industry, academia, state and local governments, and the DoD that co-invest in world-leading technologies and capabilities.
- Each institute provides facilities needed to allow collaborative, precompetitive development of promising technologies and to promote the creation of stable and sustainable innovation ecosystems for advanced manufacturing.
- The partnerships forming the institutes must commit non-federal resources that equal or exceed the federal contribution during a five- to seven-year establishment period.
- Each institute is part of the Manufacturing USA network.

FY 2019 Plans:

The major areas of emphasis for the eight DoD led manufacturing innovation institutes are:

1. Qualification and certification of additive manufacturing (AM) materials, processes, and parts, together with rigorous training and workforce development that enables DoD to further integrate AM technologies into their depots, arsenals, and shipyards to modernize their supply chains and strengthen their position.
2. Mature technology to institutionalize the digital thread across DoD manufacturing enterprises by enabling the modernization of DoD assets, lowering barriers to virtual prototyping and validation; accelerating the innovation cycle; generating dynamic responses to material needs; and lowering total system lifecycle costs from design thorough disposal. Develop tools to assist small and medium size companies for manufacturing cybersecurity.
3. Mature innovative metal lightweighting technologies across all platforms and services that save fuel and increase combat payload. Investments would address both targeted application spaces and cross-cutting enabling technologies. This includes activity in linear friction welding; design and manufacturing methods for promising high strength alloys; develop lightweight engineered structures; optimize ultra-fast heat treatment and quenching and extend the use of thin-walled casting technology to cast components for military vehicles.
4. Utilize the existing world-class 300mm integrated silicon photonics foundry in Albany, NY, the indium phosphide photonics foundry in Silicon Valley, and the world's first photonic integrated circuit test, assembly,

FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense			Date: February 2019				
Appropriation/Budget Activity 0400 / 3		R-1 Program Element (Number/Name) PE 0603680D8Z / <i>Defense Wide Manufacturing Science and Technology Program</i>		Project (Number/Name) 350 / <i>Manufacturing Innovation Institutes</i>			
B. Accomplishments/Planned Programs (\$ in Millions)			FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
<p>and packaging facility in Rochester, NY to accelerate low cost, volume manufacturing of devices for LIDAR, 5G telecom, and quantum dot lasers and the integration of advanced assembly and packaging techniques for optical elements.</p> <p>5. Mature flexible hybrid technology to support a supply chain that can produce electronics on flexible, stretchable, and 3-dimensional structures. This will create new innovative products that can be used for warfighter wearable health sensors, portable x-ray imagers, precision navigation timing packages and phased array antennas for electronic warfare and radar systems.</p> <p>6. Mature the manufacturing processes that will enable industry to produce and use smart fibers and textiles and incorporated them into innovative products using conventional weaving and knitting equipment. Advanced fabric technology offers unique solutions to critical national security challenges, including soldier communication systems; functional composite materials for ground and air vehicles; and distinctive undersea and space capabilities. Through the recently created Defense Fabric Discovery Center continue to develop a fabric-based solutions in Free Space Optical Communications (Identification Friend/Foe (IFF)) that eliminates issues of detection and jamming and is affordable and easily deployable.</p> <p>7. Mature the technology for large scale, cost-effective, reproducible manufacturing of high-quality tissues that can be used to treat severely wounded warfighters, which contributes to force readiness and saves lives on the battlefield. This includes (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.</p> <p>8. Accelerate research, development, and implementation of collaborative robotic technologies for use in manufacturing. Early use include smart companion robots for vehicle assembly, perception-aided collaborative robotic wire harness assembly, robot assistance for composites manufacturing, and robotic sanding and finishing. The focus is on (1) Versatility — robots that can perform a variety of tasks; (2) Flexibility — robots that can be deployed and re-deployed rapidly and easily; (3) Lower cost — reducing the overall cost of robot systems; and (4) Collaboration — robots that safely work alongside and with people.</p> <p>As institutes come off their initial agreement, new assistance agreements will be established. In FY19 new agreements for LIFT and DMDII will be established.</p> <p>FY 2020 Base Plans: Continue developing and maturing the ecosystem that supports the manufacturing innovation institute technology areas. Continue to look for other DoD customers that can invest in the institutes to address specific program problems. Develop an acquisition strategy that will allow for the institutes to produce prototypes that</p>							

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense				Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
can be used by DoD customers. Establish follow on agreements with institutes as the complete their startup phase. Continue to support efforts that are aligned to the National Defense Strategy (NDS) and OUSDR&E modernization priorities. Continue to work with inter-agency partners involved in the Manufacturing USA Network. FY 2020 OCO Plans: N/A FY 2019 to FY 2020 Increase/Decrease Statement: There was a Congressional add of \$15.250M to P350 in FY 2019. Additional reduction is from the change in the yearly funding profile for the institutes.						
Title: Manufacturing Science and Technology Program Description: The OSD ManTech (P680) portfolio includes a focus on above-the-shop-floor new manufacturing processes and practices having the potential to improve manufacturing efficiencies at broader, enterprise levels. Single specific projects address investment opportunities and enable the program to more surgically apply investments to compelling and sometimes urgent manufacturing needs. FY 2019 Plans: • Mature ManTech tools, technology and talent capabilities and capacity into projects across Electronics, Composites, Energetics, and Manufacturing processes. • Incorporate JDMTP, S&T, DARPA, IARPA, Service strategies, Manufacturing USA Institutes, and IPL inputs into evolving portfolio structure. • Develop best practices and relationships with industry, academia, and Service components. • New Project Starts (NDS Alignment; USD R&E Alignment) – Magnesium Oxide Binder for Thermal Batteries (Joint Lethality, Hypersonics; Hypersonics, Space Offense and Defense, Missile Defense), Foamed Celluloid Materials (Joint Lethality), Light Weight Gradient Index Lenses (Joint Lethality), Circular Polarizers for Color Day Cameras (Joint Lethality), Monolithic Spectral Beam Combiners (Directed Energy; Directed Energy, Electronic Warfare, Space Offense and Defense), High Density Reactive Materials (Joint Lethality). • Continuing Projects (NDS Alignment; USD R&E Alignment) – Fabrication of Non-Eroding Metallic Throat (Hypersonics; Hypersonics, Missile Defense, Space Offense and Defense), MEMS Navigation Grade Inertial Sensors (Joint Lethality; Command, Control and Communications, Microelectronics), Oxide-Oxide (Hypersonics,		21.512	22.328	0.000	0.000	0.000

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense				Date: February 2019		
Appropriation/Budget Activity 0400 / 3		R-1 Program Element (Number/Name) PE 0603680D8Z I Defense Wide Manufacturing Science and Technology Program		Project (Number/Name) 350 I Manufacturing Innovation Institutes		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Joint Lethality; Hypersonics), Stabilized Alpha Alane (Hypersonic, Joint Lethality; Hypersonics, Missile Defense), DBX-1 (Joint Lethality), MOC3HA (Hypersonics; Hypersonics, Missile Defense, Space Offense and Defense). • Completing Projects – Advanced Technology Capability (Classified), Cold Spray Additive Manufacturing and Structural Repair (Joint Lethality), High Yield Infrared Focal Plane Arrays (Joint Lethality, Hypersonics; Hypersonics, Space Offense and Defense), Manufacturability of Vertical Cavity Surface Emitting Lasers (Joint Lethality; Command, Control and Communications), Nanocomposite Optical Ceramic Dome (Joint Lethality, Hypersonics; Hypersonics, Missile Defense), Novel Printed Countermeasures (Joint Lethality), HighTEC (Joint Lethality), Portable X-Ray Detectors for the Dismounted Soldier (Joint Lethality), pWave (Joint Lethality; Electronic Warfare, Command, Control and Communications), Critical Energetic Materials Working Group Formulations (Joint Lethality) FY 2020 Base Plans: N/A FY 2020 OCO Plans: N/A FY 2019 to FY 2020 Increase/Decrease Statement: There was a realignment of funds to another project.						
Accomplishments/Planned Programs Subtotals		131.519	114.239	66.235	0.000	66.235
		FY 2018	FY 2019			
Congressional Add: Manufacturing Engineering Programs FY 2018 Accomplishments: This program increase entitled "Manufacturing Engineering Programs" supports Department efforts to engage in manufacturing related efforts that support improving the productivity of the defense industrial base, assisting small and medium size manufacturers (SMMs) manufacturing ability to adapt advanced manufacturing processes, engaging with the Manufacturing Extension Partnership (MEP) to support small manufacturers in areas such as manufacturing cyber security, replicating and deploying manufacturing education and work force development efforts that have been established by the Manufacturing USA institutes. This compliments efforts performed within the National Defense Education Program. Additionally, funding will		25.000	5.000			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603680D8Z / <i>Defense Wide Manufacturing Science and Technology Program</i>	Project (Number/Name) 350 / <i>Manufacturing Innovation Institutes</i>	
		FY 2018	FY 2019
be used to support Service/Agency collaboration in additive manufacturing to accelerate the adoption of additive manufacturing for acquisition and sustainment of DoD weapon systems.			
FY 2019 Plans: This program increase entitled "Manufacturing Engineering Programs" supports Department efforts to engage in manufacturing related efforts to assist in maintaining a technically trained workforce to meet the defense industrial base requirements of the Department of Defense. Competitive grants and awards are planned that will engage community colleges, technical schools and the DoD institutes to accomplish this effort.			
Congressional Add: General Increase		10.000	0.000
FY 2018 Accomplishments: This program increase funded engagements with the Manufacturing USA institutes to address specific Defense manufacturing technology challenges and opportunities. This included developing a strategy to expand the Institutes to new regions, which will allowed the Institutes to have a broader impact on the adoption of advanced manufacturing technologies by SMMs, MEPs, educational providers, and industries across the country.			
FY 2019 Plans: N/A			
Congressional Add: Manufacturing Institutes		0.000	10.250
FY 2018 Accomplishments: N/A			
FY 2019 Plans: This program increase will be used to support activities at the Digital Manufacturing and Design Innovation Institute in the following areas: (1) digital design, product development and systems engineering; (2) the digital factory of the future; (3) creating agile, resilient supply chains; and (4) cybersecurity for manufacturing.			
Congressional Add: National Security Technology Accelerator		25.000	15.000
FY 2018 Accomplishments: Education Portfolio: The Education Portfolio programs contribute to workforce development by cultivating innovators and entrepreneurs inside DoD who are adept at creative problem solving, the development of innovative approaches and technologies, and venture formation that will improve national security, as well as deliver economic and social value. Efforts include:			
1. "Boot Camps" are 4-day short courses that provide military organizations instruction on topics related to innovation and intrapreneurship (including human centered design, lean methodology, technology literacy, and psychology of innovation) and taught to apply these skills to a set of command-sponsored problem topics.			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603680D8Z / <i>Defense Wide Manufacturing Science and Technology Program</i>	Project (Number/Name) 350 / <i>Manufacturing Innovation Institutes</i>	
		FY 2018	FY 2019
<p>2. "Startup Innovation Fellowship (SIF)" is a 6-week fellowship opportunity for service members and civilians to be embedded in private companies to learn best practices in critical areas applicable to DoD such as data science, artificial intelligence and machine learning, cyber security, logistics, rapid prototyping, etc.</p> <p>3. Collaboration Portfolio (CP): The CP programs connect communities of innovators around problems and technologies relevant to national security to enable formation of new ventures.</p> <ul style="list-style-type: none"> • Hacks exposes college students and local ventures to DoD customer problems over a 48 hour period and aims to provide Minimal Viable Product (MVP) or low-TRL solutions to the sponsor. • Hacking for Defense exposes college students to DoD customer problems over an academic semester and aims to provide MVP solutions through 1 of 3 channels: formation of a venture; direct solution adoption by the problem sponsor; or reframing the original problem. • Source invites bottom-up, innovation from inside a military formation by providing either new solutions or novel applications directly to leadership from sponsoring command. • Catalyst exposes local ventures to DoD customer problems over a 6-18month period and provides high-TRL solutions for immediate adoption by the problem sponsor or a DoD contracting entity (e.g., DIU). • Acceleration Portfolio (AP): The AP programs grow and mature civil-military technology ventures by ensuring that innovators can access critical resources, including design and engineering support, mentorship services, and commercial and DoD R&D infrastructure to build, test, and enhance venture concepts. • Maker provides facilities, access, materials, and training to entrepreneurs to fabricate, develop, and facilitate rapid prototyping of their technology. • Fed Tech pairs cutting edge inventor teams and technologies from the United States federal government laboratory system with highly qualified entrepreneurs to conduct customer discovery and build business models. • MD5 Starts is a format for showcasing early stage startups who are working on technologies and products that are pursuing a dual-use market strategy. • Hatch helps entrepreneurs/teams with an idea (i.e., from H4D) learn how to form and build a venture using industry best practices. • Propel provides companies that have prototypes or initial customers with world-class education, mentorship, and relevant business connections to prepare the venture for scale while elevating their visibility in the venture community. • Gauge provides facilities, access, materials, and training to entrepreneurs to develop, iterate, and refine their technology up to TRL 6/7. Also provide access to test and development ranges. • Launch identifies existing government technology that can be applied to a stated customer problem or problem set and to then work with a team on a path to commercialize the technology. 			

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Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603680D8Z / <i>Defense Wide Manufacturing Science and Technology Program</i>	Project (Number/Name) 350 / <i>Manufacturing Innovation Institutes</i>	
		FY 2018	FY 2019
<ul style="list-style-type: none"> • Boost provides opportunities for companies to secure early, non-dilutive government funding in the form of grants or contracts working the SBIR program. • Bridge provides founding teams with mentors and advisors who can help them in business, customer, and product development by providing the right advice and insights at the right time. 			
FY 2019 Plans: The FY 2019 Congressional Add supports continuation of activities initiated in FY 2018.			
Congressional Add: Gallium Nitride (GAN) Semiconductor Technology		14.738	0.000
FY 2018 Accomplishments: The \$15.000 million increase for GaN Semiconductor Technology will leverage existing GaN ManTech efforts looking to support and expand the GaN ecosystem in the areas of design, fabrication, and test.			
FY 2019 Plans: N/A			
Congressional Add: Advanced Manufacturing		0.000	30.000
FY 2018 Accomplishments: N/A			
FY 2019 Plans: Coordinating with Service Matter Experts (SMEs) in Cold Spray Technology to expand usage of Cold Spray technology to DoD organic repair and maintenance facilities, develop part families for land, air, and sea applications, and expand the Cold Spray supply chain to meet additional DoD applications.			
Congressional Adds Subtotals		74.738	60.250
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.			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603680D8Z / <i>Defense Wide Manufacturing Science and Technology Program</i>	Project (Number/Name) 350 / <i>Manufacturing Innovation Institutes</i>

E. Performance Metrics

Assessing the performance of the DoD-led manufacturing institutes, part of the whole-of-government Manufacturing USA Program, requires a multi-faceted view of 'performance,' given the program's layered base of DoD, government-wide, and national level public-private stakeholders and interests. Notwithstanding this complexity, the Department is careful to maintain orientation with the DoD ManTech program's statutory goals and objectives and has concluded that those requirements are highly complementary to, and supportive of, the broader national goals of the Manufacturing USA Program as laid out in the Revitalize American Manufacturing and Innovation (RAMI) Act of 2014. Performance relative to both sets of goals/objectives is necessarily measured in both qualitative and quantitative terms, and many of the institutes accomplishments previously addressed represent rich and highly descriptive qualitative and quantitative measure of program performance. The Department actively reviews or oversees the review of institute metrics at four levels: 1) the overall Manufacturing USA network level (this is done in coordination with the DoD's Manufacturing USA interagency partners), 2) at the DoD/funding agency level (per the statutory requirements of DoD ManTech Program), 3) at the individual institute level (in coordination with each institute), and 4) at the specific technology project level (via DoD technical expert involvement in the institutes). Broadly, the institutes themselves are charged by the DoD, the Administration and Congress with ensuring that key elements of their innovation ecosystems will be matured and made widely available by fostering collaborations between appropriate elements of that ecosystem.

The following four categories of metrics have emerged as common focus areas:

1. Impact on U.S. Innovation Ecosystem
2. Financial Leverage/Sustainability
3. Education and Advanced Manufacturing Workforce Development
4. Technical Advancement

Specific metrics and the annual cycle for measuring progress against benchmarks are developed for each institute consortium and reflect that institute's unique technology capability, expertise, and organizational structure. The Department strives to ensure that the assessment process captures and articulates the benefits to national security based upon technological advancements and the industrial base.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 3: Advanced Technology Development (ATD)</i>					R-1 Program Element (Number/Name) PE 0603699D8Z I <i>Emerging Capabilities Technology Development</i>							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	298.656	79.469	60.700	80.911	-	80.911	75.284	76.368	77.379	78.990	Continuing	Continuing
795: <i>Emerging Capabilities Technology Development</i>	298.656	65.488	52.718	70.940	-	70.940	65.316	66.402	67.416	68.040	Continuing	Continuing
713: <i>High Energy Laser</i>	0.000	13.981	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
717: <i>Red Teaming</i>	0.000	0.000	7.982	9.971	-	9.971	9.968	9.966	9.963	10.950	Continuing	Continuing

Note

The Emerging Capabilities Technology Development (ECTD) Program Element (PE) will be augmented in FY 2020 to increase the Program's ability to conduct risk-reducing joint prototyping; joint red teaming for validation of emerging technologies; and, joint experimentation, demonstration, and concepts of operation (CONOPs) development. In FY 2020 all funding and appropriate project investment areas from the Quick Reaction Fund (project-code 826 within Program Element (PE) 0603826D8Z) will be incorporated into ECTD. Additionally, in FY 2020, funding and activities for the Silent Hammer project will be incorporated into the ECTD program.

ECTD funding enables project selection in the year of execution and provides leadership within the Office of the Under Secretary of Defense for Research and Engineering (OUSD (R&E)) with the flexibility and agility to anticipate and quickly respond to emergent DoD issues, time-sensitive threats, and innovation opportunities. The program collaborates with and leverages government labs, academia, and industry to execute its mission in support of the National Defense Strategy, Joint Staff, and DoD modernization priorities. Completed ECTD projects transition to joint programs through fielded operationally relevant prototypes; technology adoption into programs of record; integration into system level, multi-year joint demonstrations; and through advanced research and engineering efforts like the Warfighting Lab Incentive Fund for further development of tactics, techniques, procedures, and concepts of operations.

A. Mission Description and Budget Item Justification

In alignment with the National Defense Strategy (NDS), the Emerging Capabilities Technology Development (ECTD) Program Element supports the 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 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. The 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 that transfers to ECTD in FY 2020; 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.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603699D8Z I <i>Emerging Capabilities Technology Development</i>
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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. Although projects are selected in the year of execution, anticipated FY 2020 technology areas include employment of directed energy from aircraft; multi-domain, autonomous learning systems; enabling technologies for missile defense; and, increased soldier lethality systems. Project selection is guided by Department-level strategies and priorities, such as the National Defense Strategy, the Chairman's Capability Gap Assessment, and DoD modernization priorities.

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	57.876	48.338	51.162	-	51.162
Current President's Budget	79.469	60.700	80.911	-	80.911
Total Adjustments	21.593	12.362	29.749	-	29.749
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-5.000			
• Congressional Rescissions	-	-			
• Congressional Adds	27.500	17.500			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-1.795	-			
• FFRDC Adjustment	-0.112	-0.138	-	-	-
• Congressional Reduction	-4.000	-	-	-	-
• Internal Realignment for Higher Priorities	-	-	29.749	-	29.749

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

Project: 795: *Emerging Capabilities Technology Development*

Congressional Add: *Technical Support and Operational Analysis (TSOA)*

Congressional Add: *Low-Collateral Damage Warhead (LCDW)*

Congressional Add: *Air Base Resilience Sensor*

Congressional Add: *High-Altitude Optical Reconnaissance Unit and Sensor (HORUS)*

Congressional Add Subtotals for Project: 795

Congressional Add Totals for all Projects

	FY 2018	FY 2019
	5.000	-
	5.000	-
	7.500	7.500
	10.000	10.000
Congressional Add Subtotals for Project: 795	27.500	17.500
Congressional Add Totals for all Projects	27.500	17.500

Change Summary Explanation

The FY 2020 baseline increase is the result of the transfer in of funds from the Quick Reaction Fund in Program Element 0603826D8Z (Quick Reaction Special Projects) for additional risk-reducing joint prototyping, joint red teaming for validation of emerging technologies, and funding for experimentation venues.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
795: Emerging Capabilities Technology Development	298.656	65.488	52.718	70.940	-	70.940	65.316	66.402	67.416	68.040	Continuing	Continuing
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 2018	FY 2019	FY 2020	
Title: Raven Flash									3.563	3.240	-	
Description: The Raven Flash project directly supports the Secretary of Defense's priority for increased lethality through the development and demonstration of an adaptable, agile, electronic warfare capability. This previously funded prototyping effort uses integrated source system components and associated high performance materials to enable targeted electronic warfare effects. FY 2018 efforts included development and integration of component sub-systems culminating in a “brass-board” system demonstrator and experimentation that included a functional assessment of the Raven Flash architecture in a laboratory environment against challenging classes of surrogate electronic systems. Details of this project are classified.												
FY 2019 Plans:												
Raven Flash will develop a fully integrated, functionally-relevant prototype system. Activities to design, fabricate, assemble, and test the Raven Flash prototype will be conducted. The relative performance of the system will be characterized, assessed, and validated against a selected high-fidelity, relevant electronic system in a laboratory environment. Using FY 2019 funding, Raven Flash will complete prototype integration on a representative platform and subsequent demonstrations before transition to a classified customer.												
FY 2019 to FY 2020 Increase/Decrease Statement:												
This project will be completed in FY 2019.												
Title: Silent Hammer									-	-	5.000	
Description: Starting in FY 2020, the Silent Hammer (SH) demonstration venue will transfer to the Emerging Capabilities Technology Development (ECTD) Program Element in support of the Secretary of Defense's priority to increase the rate of innovation and deliver performance at the speed of relevance. Leveraging the Joint Electronic Advanced Technology (PE 0603618D8Z) program's history of conducting highly successful experimentation venues, SH is a multi-year, multi-agency, series of field experimentation activities. SH explores and demonstrates new electronic warfare (EW) technologies and approaches												

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
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 2018	FY 2019	FY 2020
through the use of large-scale, dynamic field experiments. SH focuses on advancing the state-of-the-art for detecting, classifying, and geo-locating electromagnetic signals of interest through novel technologies such as multi-platform, multi-aperture, multi-domain (M3) passive/active sensing in complex and congested electromagnetic spectrum (EMS) environments. SH includes both scripted and dynamic scenarios to experiment with the efficacy of both existing and new capabilities and approaches to engage emerging EMS 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. FY 2020 Plans: SH will complete a debut venue in late FY 2019. To better leverage other OSD demonstration efforts SH will transition from Joint Electronic Advanced Technology (PE 0603618D8Z) to ECTD in FY 2020. The FY 2020 SH venue will focus on the most pressing EW challenges for M3 passive/active sensing and command, control, communications, and computing architectures. Selection of FY 2020 demonstrations will occur in the year of execution and involve the EW Community of Interest and other key stakeholders to ensure maximum relevance and benefits to joint Services' and Defense Agencies' efforts. FY 2019 to FY 2020 Increase/Decrease Statement: Silent Hammer is a new effort within ECTD starting in FY 2020.				
Title: Quartz Disk Resonator Gyroscope (QDRG) Description: The QDRG project directly supports increased lethality for dismounted soldiers and the objectives of the National Defense Strategy. Building on FY 2017 accomplishments, QDRG prototyped and demonstrated a next-generation low size, weight, power, and cost (SWaP-C), navigation-grade gyroscope for position, navigation, and timing applications. This micro-electromechanical systems (MEMS) technology enables precision targeting, navigation, and tracking with reduced error in Global Positioning System denied environments. The reduced SWaP-C enables the technology to be incorporated into hand-held and small autonomous systems across the Services. FY 2018 efforts focused on etching optimized quartz disks, design and fabrication of control electronics, and vacuum packaging for laboratory test and validation. Transition partner funding supports package design modifications to enable a final prototype that can be leveraged as a north-finding system or integrated with MEMS accelerometers into an internal navigation system. In FY 2019 QDRG prototype components will transition to the Joint Effects Targeting System, the Lightweight Laser Designator Rangefinder, and the Long Range Advanced Scout Surveillance System programs of record.		1.750	-	-
Title: Spectral Exploitation Camera for Targeting and Reconnaissance (SPECTRE) Description: The SPECTRE project demonstrated a hyperspectral imaging (HSI) prototype to support battlespace awareness and the National Defense Strategy's objective to field a more lethal force. The SPECTRE project completed an FY 2017 initiated effort		2.000	-	-

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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 2018	FY 2019	FY 2020
to develop and demonstrate a greatly reduced size, weight, and power (SWaP) HSI capability that is compatible with multiple manned and unmanned platforms across the DoD. The SPECTRE prototype provided the ability to perform stand-off detection of materials or targets of interest, enabling rapid target identification and shortening the kill-chain. In FY 2018, SPECTRE developed a first-in-its-class, dual-field-of-view telescope with the ability to change optical path and field-of-view to adjust for off-nadir imaging. The project also designed a robust pointing and stabilization optical path within a customized pod to enable integration with unmanned platforms. In FY 2019 the project will complete pod construction, integration, and lab testing, leading to a SPECTRE flight test with remaining FY 2018 funds. Leveraging partner funding in FY 2019, SPECTRE will transition to a deployed unmanned aerial system. This effort also informs Program Objective Memorandum efforts for two U.S. Army program of record aerial systems.				
<p>Title: Distributed Collaborative Electronic Warfare & Radar (DISCOVER)</p> <p>Description: The previously funded DISCOVER project supports the National Defense Strategy’s priority for increased lethality and the Department of Defense’s modernization priority for fully networked command and control. DISCOVER will develop and demonstrate a fully networked, integrated, multi-function prototype to support multiple radio frequency (RF) concepts of operation (CONOPs) in a small form factor prototype. DISCOVER activities in FY 2018 included development and demonstration of electronic warfare (EW) and radar algorithms using commercial off the shelf hardware. The project also designed and prototyped RF subsystem hardware, implemented EW and radar algorithms, and assessed the field performance of prototype hardware against CONOPs in development for the FY 2019 prototype demonstration.</p> <p>FY 2019 Plans: To support a FY 2019 field demonstration, DISCOVER will complete algorithm development then integrate and test final RF hardware and antennas. Subsequent FY 2019 field experimentation will explore the DISCOVER prototype and impacts on squad level operations. DISCOVER will transition to the U.S. Marine Corps for continued CONOPS experimentation followed by further maturation by the U.S. Army.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: DISCOVER efforts conclude at the end of FY 2019 with a demonstration of an integrated, multi-function, net-centric capability.</p>		1.814	1.450	-
<p>Title: Compact Adaptable Ballistic Technology (CAB-T)</p> <p>Description: The CAB-T prototype will significantly increase dismounted soldier lethality and directly supports the National Defense Strategy focus to develop a more lethal force. The previously funded CAB-T project integrated lightweight materials and simplified cycling to enhance warfighter lethality through compact kinematic performance in an adaptable design. CAB-T assessments included the effects of material properties, mechanical interaction, operating pressure, and cartridge-mechanism interactions. The demonstrated prototype will achieve a modular ballistic system in a compact form factor to enable users</p>		1.300	0.800	-

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
to rapidly adapt to mission requirements. CAB-T activities in FY 2018 included the development and integration of custom components, assessment of user interfaces, and initial validation of compact ballistic technology modeling via subsystem laboratory testing. FY 2019 Plans: In FY 2019, CAB-T will demonstrate compact ballistic technology in parallel with refinement of the CAB-T user interface. The project will also incorporate adaptable design elements into a modular plug-and-play prototype. Final integration of compact ballistic technology with CAB-T user interface will be completed with FY 2019 funding followed by experimentation leveraging transition partner expertise. The CAB-T prototype and final assessment with technical data package will transition to a classified user. FY 2019 to FY 2020 Increase/Decrease Statement: CAB-T efforts will be completed at the end of FY 2019 and the prototype will transition for further maturation and sustainment by the user.				
Title: Low-Cost Precision Intercept Description: Low-Cost Precision Intercept supports the National Defense Strategy’s priority to develop a more lethal force. Initially funded in FY 2017, the project will demonstrate the viability of an ultra-low size, weight, power, and cost terminal guidance seeker paired with a small unmanned aerial system (sUAS) to provide a low-cost, long-range platform capable of close range intercept of sUAS threats. In FY 2018, this project integrated the prototype sensor onto a sUAS platform interceptor vehicle. Testing and experimentation demonstrated a tactically relevant autonomous encounter with a sUAS threat and explored various concepts of operation. FY 2019 Plans: After demonstrating concept feasibility in FY 2018, FY 2019 funds and transition partner support enables adaption to the form, fit, and function of the terminal guidance sensor at a relevant military radar band. The final prototype sensor will be integrated onto a sUAS platform specified by the Special Operations transition partner. FY 2019 to FY 2020 Increase/Decrease Statement: Low-Cost Precision Intercept efforts will be completed at the end of FY 2019.		1.750	1.050	-
Title: Joint Response Integrated and Collaborative (JRICO) Decision Support Tool Description: The JRICO project supports the National Defense Strategy objective of delivering performance at speed while creating a more lethal force. JRICO demonstrates the use of machine learning, a Department of Defense technology modernization priority, to interpret unstructured data resulting in an interoperable and collaborative framework to improve time-critical decision making. JRICO improves operational planning through big data analytics to perform rapid analysis and seamless		1.850	1.250	-

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
information sharing with increased speed and fidelity. JRICO will mature a prototype capability and demonstrate a secure, multi-domain, decision-support cloud capability for U.S. Indo-Pacific Command by integrating, sharing, and visualizing structured and unstructured data from disparate systems. An icon-based drag and drop interface informed with big data analytics allows JRICO to support deliberate strategic planning and rapid crisis response, integrated situational awareness, and tailored visualization. In FY 2018, JRICO completed the technical architecture development and initial design packages for the final prototype. FY 2018 activities also finalized the data tagging strategy and began planning work for FY 2019 assessments. FY 2019 Plans: The JRICO prototype will demonstrate an application registry and big data analytics that includes building a visualization registry for applications and publishing across a cloud computing-based, collaborative, multi-domain environment. JRICO will also conduct a military utility assessment with U.S. Indo-Pacific Command before transitioning to the Joint Capability Requirements Manager, the Preferred Force Generation, and the Joint Capability Support to National Emergencies. FY 2019 to FY 2020 Increase/Decrease Statement: JRICO efforts conclude at the end of FY 2019.				
Title: Software-Defined Radar (SDRadar) Description: SDRadar leverages machine learning to help support the Department of Defense modernization priority for missile defense. This project demonstrates a prototype cognitive SDRadar to inform the development and demonstration of joint solutions for a resilient radar capability in congested and contested electromagnetic environments (EMEs). The SDRadar prototype will demonstrate enhanced target detection and tracking in a variety of scenarios of interest to the U.S. Army and U.S. Air Force. In FY 2018, improvements to prototype SDRadar hardware and software were implemented. FY 2019 Plans: SDRadar prototype maturation will continue in FY 2019 focusing on innovations to the hardware and software to enhance target tracking in congested EMEs. Using FY 2019 funds, SDRadar will culminate in an early FY 2020 demonstration transitioning into multiple Service programs of record. FY 2019 to FY 2020 Increase/Decrease Statement: Using FY 2019 funds, SDRadar will be completed in FY 2020.		2.000	1.300	-
Title: Situational Awareness Data Link (SADL) for Stand-Off Precision Guided Munitions (SOPGM) Description: SOPGM directly supports the National Defense Strategy's priority for increased lethality and delivering performance at speed, by rapidly prototyping and integrating a miniaturized SADL radio into stand-off precision guided munitions (SOPGMs). The resulting prototype system will enable enhanced surgical strikes against high value and irregular warfare targets in multiple environments, including urban, GPS-denied, and adverse weather. Integration of the data link radio into SOPGMs will significantly		2.400	0.700	-

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
enhance lethality, shorten kill-chains, and reduce collateral damage for the AC-130W/J gunship, Special Operations Forces (SOF) MQ-9 Reaper, and SOF MQ-1C Gray Eagle by enabling command and control of SOPGMs following launch. In FY 2018, the preliminary design review and prototype fabrication was completed for follow-on integration and fielding in FY 2019.				
FY 2019 Plans: In FY 2019, the project will complete integration of the SADL-SOPGM prototype system onto a platform. Subsequent SADL-SOPGM demonstrations will culminate in live fire testing and evaluation. The SADL SOPGM capability will transition to U.S. Special Operations Command (USSOCOM) with an expected initial operational capability in FY 2020.				
FY 2019 to FY 2020 Increase/Decrease Statement: SADL-SOPGM efforts will be completed at the end of FY 2019.				
Title: Software Defined Soldier		1.760	-	-
Description: The SDS project supports the Department of Defense modernization priority for fully networked command and control by developing an agile software-defined radio and application based user interface (UI). SDS provides the dismounted warfighter with a multi-function radio frequency capability, including communications, electronic warfare, and passive radar in a modular, plug-and-play package. Through the application based UI, the SDS device is reconfigurable on demand and can be upgraded through tailored software packages. In FY 2018, this project upgraded the SDS prototype hardware and matured the UI to enable a variety of applications. Using FY 2018 funds, work continues in FY 2019 on development of the firmware and finalizing the application software. After successful testing, the SDS prototype will transition in FY 2019 to the U.S. Special Operations Command for evaluation and operational use.				
Title: Polar Skywave		2.700	1.000	1.000
Description: Polar Skywave 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. The Polar Skywave project will mature and experiment with 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. Beginning in FY 2018, the Polar Skywave prototype sensor focused on ten major tasks to extend skywave radar to polar regions including deployment of HF radar hardware for a scaled model and refinement of signal processing techniques that leverage machine learning.				
FY 2019 Plans:				

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>Building on initial design and hardware installations, FY 2019 activities will collect data and refine signal processing algorithms. The project will use results from the first bi-directional transmission of radar signals to further develop and expand transmit and receive arrays.</p> <p>FY 2020 Plans: FY 2020 tasks will include continued data measurement, algorithm refinement, and HF communication experimentation. Leveraging MDA funding, Polar Skywave will culminate in a real-time operational demonstration with targets of opportunity before hardware and algorithms transition to Air Force Life Cycle Management Center (LCMC).</p>			
<p>Title: Advanced Tactical Power Generation (ATPG)</p> <p>Description: ATPG directly supports the National Defense Strategy's priority for increased lethality by prototyping a vehicle centric, mobile, fast forming, secure, intelligent microgrid. The ATPG prototype will provide ad hoc, resilient power for next generation electronic warfare, directed energy, and missile defense technologies and will enable: (1) on the move power generation to supply advanced protection system for maneuver forces; (2) improved logistics through reduced fuel consumption; and, (3) reduction in time required to setup, transport, and redeploy power generation systems. In FY 2018, subcomponent requirements and initial prototype designs were matured for critical design reviews scheduled for FY 2019.</p> <p>FY 2019 Plans: In FY 2019, the project will complete subsystem component fabrication and testing. Using FY 2019 funds, on-vehicle integration activities will be followed by integrated system testing in FY 2020. The initial prototype will transition to U.S. Army Product Manager Terminal High Attitude Area Defense (THAAD) for operational testing.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Advanced Tactical Power Generation efforts will be completed at the end of FY 2019.</p>		2.801	2.503
<p>Title: Printable Flexible Electronics with Nanomaterials Heterostructures (PFLEX)</p> <p>Description: PFLEX supports the National Defense Strategy's priority to deepen defense cooperation between the U.S. and partner nations. This project, conducted in partnership with India's Defense Research and Development Organization, will prototype a wearable microelectronic sensor system for environmental monitoring of potentially hazardous confined spaces. The PFLEX project will demonstrate prototype units implementing a flexible electronic system architecture combined with oxygen and broad band volatile organic compound (VOC) sensors. In FY 2018, activities focused on modeling and simulation of electrical, thermal, and mechanical properties of materials printed on the flexible substrate.</p> <p>FY 2019 Plans:</p>		1.600	1.000

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
Building on the FY 2018 activities, PFLEX will package, calibrate, and test the oxygen and VOC sensors prior to integration into the advanced flexible sensor platform. The prototype units will transition to the U.S. Air Force for testing and follow on development activities.				
FY 2019 to FY 2020 Increase/Decrease Statement: PFLEX efforts will be completed at the end of FY 2019.				
Title: Rapid 3D (R3D) Data Generation		2.500	1.300	1.000
Description: R3D directly supports the National Defense Strategy’s priority for increased lethality through advanced simulations, synthetic training environments, and by providing superior knowledge of the battlespace during mission preparation and execution. The R3D prototype will provide critical battlespace awareness to the warfighter, enabling rapid and accurate decision making at the tactical edge by closing the gap in terrain data for detailed tactical planning. Incorporating machine learning enabled algorithms for geospatial intelligence processing and exploitation, R3D will create a national repository of open standard, globally correlated, 3D terrain data for operations, intelligence, and training. This repository will enable interoperability required for short notice, joint mission rehearsal in addition to a creating a common domain for rapid experimentation with future operational concepts. In FY 2018, R3D replicated 3D terrain data across the DoD enterprise and tested compatibility of 3D data with applications supporting tactical mission planning and execution for USSOCOM and U.S. Army missions.				
FY 2019 Plans: Building on the FY 2018 activities, R3D continues technical risk reduction activities and capability gap assessment for Services, Combatant Commands, and the National Geospatial-Intelligence Agency (NGA). R3D will also mature algorithms and the system architecture to deliver 3D terrain data across the DoD and intelligence community enterprise. End user assessments, joint exercises, and iterative test and evaluation activities are incorporated to refine the prototype system.				
FY 2020 Plans: In FY 2020, R3D will undergo final operational test and evaluation prior to transitioning to the NGA, USSOCOM, and Services.				
FY 2019 to FY 2020 Increase/Decrease Statement: R3D efforts will be completed at the end of FY 2019.				
Title: Project 18		3.200	0.800	-
Description: Project 18 directly supports the National Defense Strategy's priority for increased lethality by demonstrating an organic counter unmanned aircraft system (CUAS) capability for use by small units. The project will integrate a novel non-kinetic capability to defeat adversary UAS onto existing operational platforms and experiment with the resulting prototype to inform CONOPS. Additional details are classified. In FY 2018, the preliminary design review was completed resulting in a design for				

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
a novel prototype payload. Fabrication and initial effects testing was also completed with FY 2018 funding to support system integration in testing in FY 2019.			
FY 2019 Plans: Building on the FY 2018 maturation, the initial prototype will complete fabrication and undergo test and experimentation to characterize combat performance. In FY 2019 Project 18 will transition to the U.S. Special Operations Command (USSOCOM) for final evaluation and operational use.			
FY 2019 to FY 2020 Increase/Decrease Statement: Project 18 efforts will be completed at the end of FY 2019.			
Title: Multi-domain Experimentation and Demonstration Venues		5.000	5.000
Description: These complementary, agile, and flexible experimentation and demonstration capabilities and venues support the National Defense Strategy's priority to increase the rate of innovation and enable Service, Combatant Command, and Agency user evaluation of emerging novel technologies in relevant environments. Demonstration venues include the Thunderstorm venue for small and non-traditional businesses; the Stiletto maritime technology platform; and, other tailored multi-domain venues and ad-hoc demonstrations. These experimentation and demonstration venues support the rapid discovery and transition of emerging technologies across the range of military operations. The venues provide the DoD and interagency partners with an opportunity to identify and evaluate new and emerging technologies both from commercial and government sectors through a series of technology demonstrations, experiments, vignettes, and related activities. The venues also offer a streamlined experimentation and demonstration process that encourages system developers to engage directly with the warfighter. These engagements enable rapid innovation and adoption of new technologies to meet operational needs through the exploration of military utility, and identification of potential risks of emerging technologies.			
In FY 2018, Thunderstorm, Stiletto, and other venues conducted 20 demonstration and experimentation events which featured 124 innovative technologies from focus areas including dense urban and subterranean warfare; enhanced lethality for small unit operations; tactical ISR; and, resilience for collaborative systems of networked sensors. Seventeen of these technologies transitioned directly to DoD operational users or were leveraged by formal programs of record, including an autonomous maritime landing system for unmanned autonomous vehicles (UAVs); a long-range geolocation capability; and, a long-range vertical takeoff and landing fixed-wing UAV. In FY 2018, these demonstration and experimentation venues also provided 75 small businesses and non-traditional innovators with the warfighter feedback critical to rapidly mature their technologies into viable prototypes.			
FY 2019 Plans: Building on previous experience, six to eight demonstrations to accelerate innovation are planned for FY 2019. These demonstrations will focus on operations in megacities, security for fully-networked command and control, building partnerships,			

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
and machine learning enabled sensors for detection of rare events. Capabilities evaluated will include multi-domain operations, ubiquitous sensors and technologies for increased small unit lethality, diver detection in harbors, and other priorities identified through engagement with stakeholders.			
FY 2020 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 Military Services, the Combatant Commands, the Intelligence Community, and other operational users.			
Title: Conceptual Prototyping to Support DoD Modernization Priorities		-	48.940
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 key component technologies and representative prototypes of fully networked command, control, and communications; space; autonomy; hypersonics; microelectronics; cyber; quantum science; directed energy; and machine learning systems to accelerate development and adoption of cost effective and interoperable solutions for defense challenges. Selected limited-duration projects design, mature, and deliver conceptual prototypes to reduce the time from idea to demonstrated capability; mitigate risk in DoD programs; and, help characterize potential 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.		3.825	
FY 2019 Plans: This focus area will mature concepts and designs through conceptual prototyping that result in interoperable solutions. While project determinations are generally made in the year of execution, projects to be considered will address challenges within the DoD modernization priorities. Potential areas to investigate through conceptual prototyping include quantum sensing and processing; machine learning to gain a competitive military advantage; novel microelectronics and microelectromechanical systems; dismounted electromagnetic spectrum technologies for communications and distributed electronic warfare; implementation of directed energy on small, low-cost autonomous platforms; and component technologies with the potential to enable disruptive space capabilities.			
FY 2020 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			

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B. Accomplishments/Planned Programs (\$ in Millions)			FY 2018	FY 2019	FY 2020
new concepts and technology prototypes aimed at supporting the Joint Force. 15 to 20 prototype efforts are anticipated in FY 2020 leveraging Joint, Service, and interagency partnerships.					
FY 2019 to FY 2020 Increase/Decrease Statement: The FY 2018 and FY 2019 funding levels are lower than the baseline for this focus area, which is listed under FY 2020. This is because once projects are selected and funded during the years of execution (FY 2018/2019), the funds for these projects are reported elsewhere in this R-2. Projects have not been selected for FY 2020.					
Title: India Science and Technology Partnerships Focus Area Description: The India Science and Technology (S&T) Focus Area is a Secretary of Defense directed program designed to deepen defense cooperation between the United States and India. By sharing research resources, capabilities, and expertise, the United States and India can jointly develop the technological innovations needed to enable our defense industrial bases to support our militaries now and in the future. Further, development of vibrant S&T cooperation is a key step in building an enduring partnership. In FY 2018, funding was transferred from Joint Capability Technology Demonstration (JCTD) (Program Element 0603648D8Z) to better enable alignment and execution of the allocated funds. This funding supported printable flexible electronics with nanomaterials and autonomous mission control algorithms for small, swarming UAVs. FY 2019 Plans: The India Science and Technology Focus Area and related funding will continue to develop and execute cooperative S&T projects. Additional cooperative S&T areas targeted include: munitions development, advanced manufacturing, micro-power grids, and other identified project areas. Project selection is made during the year of execution in coordination with military representatives from India. FY 2020 Plans: FY 2020 projects will be selected in the year of execution and will continue to focus on India and other nations to support the Secretary of Defense's priorities for multi-national collaboration. Projects to be considered will support DoD Research and Engineering Enterprise Strategic Priorities that can be jointly developed through cooperative S&T projects.			-	10.000	10.000
Accomplishments/Planned Programs Subtotals			37.988	35.218	70.940
			FY 2018	FY 2019	
Congressional Add: Technical Support and Operational Analysis (TSOA)			5.000	-	
FY 2018 Accomplishments: The Technical Support and Operational Analysis is an FY 2018 program increase to provide Joint and Service developers with realistic, relevant, operator driven, and scenario based assessments that challenge technologies in complex environments against emerging threats. The program					

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		FY 2018	FY 2019
provides feedback from engineers, scientists, operators, and technical threat emulation experts early in the development of a technology to enable rapid innovation or shifts in technology investments. In FY 2018, TSOA partnered with the Defense Threat Reduction Agency to execute a network-security and chemical/biological detection red team assessment. Using FY 2018 funds, work continues in FY 2019 to conduct red teaming on remote advise and assist technologies, augmented reality systems, and force protection in large urban areas. TSOA informs industry on Department of Defense potential vulnerabilities and identifies the tactics, techniques, and procedures that lead to the discovery and exploitation of vulnerabilities. TSOA also identifies possible mitigation pathways and shares these discoveries with the DoD RDT&E community, acquisition community, and Combatant Commands. This technology area is a congressional interest item and additional resources were provided above the President's budget request.			
Congressional Add: Low-Collateral Damage Warhead (LCDW) FY 2018 Accomplishments: This project is an FY 2018 program increase to rapidly prototype, integrate, and test a carbon-fiber composite, fragmentation-less warhead onto the GBU-69 small glide munition to enable precision strike with extremely low collateral damage in urban environments. The LCDW design was completed and tested to validate the focused lethality footprint in static arena tests. Using FY 2018 funding, work continues in FY 2019 to validate and certify the LCDW capability through static arena testing, with follow-on flight testing planned for third quarter FY 2019. Upon successful completion of all testing, USSOCOM will field the LCDW for an operational assessment in late FY 2019. This technology area is a congressional interest item and additional resources were provided above the President's budget request.		5.000	-
Congressional Add: Air Base Resilience Sensor FY 2018 Accomplishments: The Air Base Resilience Sensor directly supports the National Defense Strategy's priority for increased lethality through rapidly prototyping and integrating an advanced sensor system concept to enhance detection and tracking of threat systems. Previous funding in FY 2016 and FY 2017 developed an advanced sensor chip assembly (SCA) prototype to validate the expected performance in an operationally-relevant environment. In FY 2018, the project fabricated multiple prototype test units which incorporate the SCA, and developed the software to network multiple prototype test units into a sensor system architecture. This technology area is a congressional interest item and additional resources were provided above the President's budget. Details of this project are classified. FY 2019 Plans: Building on the FY 2018 activities, Air Base Resilience Sensor will execute a series of tests against targets in an operationally relevant environment to evaluate the performance of the networked sensor		7.500	7.500

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		FY 2018	FY 2019
system prototype and make refinements to the system prior to a system demonstration anticipated to occur in late FY 2020.			
Congressional Add: High-Altitude Optical Reconnaissance Unit and Sensor (HORUS)		10.000	10.000
FY 2018 Accomplishments: The HORUS project is a Congressional program increase to design, build, and evaluate a prototype capability for a high-altitude sensor system with military utility for the joint warfighter. HORUS will mature an electro-optical prototype system to support pattern of life analysis at extreme distance that is adaptable to multiple manned or unmanned aircraft. The HORUS prototype will support day or night operations by providing multi-spectral, high definition full motion video from extreme slant ranges. In FY 2018, activities focused on completing the sensor design, fabrication, and testing of two prototype HORUS units.			
FY 2019 Plans: Building on FY 2018 accomplishments, FY 2019 funds will be used to refine the HORUS prototypes and complete additional testing required prior to conducting an initial operational assessment in the U.S. Central Command area of responsibility. This project will transition to U.S. Special Operations Command.			
Congressional Adds Subtotals		27.500	17.500
C. Other Program Funding Summary (\$ in Millions)			
N/A			
Remarks			
D. Acquisition Strategy			
Building on FY 2018 accomplishments, FY 2019 funds will be used to refine the HORUS prototypes and complete additional testing required prior to conducting an initial operational assessment in the U.S. Central Command area of responsibility. This project will transition to U.S. Special Operations Command.			
E. Performance Metrics			
Emerging Capabilities Technology Development (ECTD) supports the FY 2020 performance metrics to transition projects that address Joint Force and Combatant Command capability gaps. In FY 2018, ECTD transitioned six projects with an overall transition rate of 86 percent. All ECTD projects are monitored for schedule deviation, transition outcome, and deliverables such as hardware, software, and other components.			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 3					R-1 Program Element (Number/Name) PE 0603699D8Z / <i>Emerging Capabilities Technology Development</i>				Project (Number/Name) 713 / <i>High Energy Laser</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
713: <i>High Energy Laser</i>	0.000	13.981	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

A. Mission Description and Budget Item Justification
 This initiative supports the U.S. Special Operations Command's (USSOCOM) effort to explore the operational capability for an AC-130 modified with a high energy laser (HEL). This funding enables analysis and risk reduction efforts to accelerate development of an HEL weapon system for USSOCOM missions.

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
Title: AC-130 High Energy Laser (HEL) Description: This project executed risk-reduction activities that informed the development and planned FY 2022 airborne demonstration of the USSOCOM Airborne High Energy Laser tactical prototype. Funded risk reduction activities included modernization of existing laser control equipment, development of diagnostic assemblies, design and fabrication of an isolation structure, measuring laser performance while in a simulated aircraft environment, aircraft optical window mount and fairing development, and modifications to existing AC-130 Battle Management System (BMS) to support laser operations. These activities informed the Airborne HEL tactical prototype design and enable early identification of required engineering design changes for major HEL subsystems. Using FY 2018 funds, work continues in FY 2019 including optical window mounting, laser diagnostics, BMS modifications, and development of aircraft isolation systems. After successful ground risk reduction testing, the risk reduction effort will transition in FY 2019 to USSOCOM to continue prototype development and airborne testing.	13.981	-	-
Accomplishments/Planned Programs Subtotals	13.981	-	-

C. Other Program Funding Summary (\$ in Millions)
 N/A

Remarks
 N/A

D. Acquisition Strategy
 N/A – USSOCOM will support subsequent development and acquisition strategy.

E. Performance Metrics
 USSOCOM defines specific performance metrics to evaluate the risk reduction effort and determine future investments. The project results are reviewed by a senior review group comprised of representatives from the Office of the Secretary of Defense, USSOCOM, Combatant Commands, and outside subject matter experts. The ultimate measure of success is transition to the USSOCOM operational user.

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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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
717: Red Teaming	0.000	0.000	7.982	9.971	-	9.971	9.968	9.966	9.963	10.950	Continuing	Continuing

A. Mission Description and Budget Item Justification

The Red Teaming project assesses the susceptibility and vulnerability of emerging technologies and newly developed systems. Red teaming helps identify unanticipated disruptive opportunities and technological dead ends. The project supports red teaming demonstrations to stress and assess emerging systems in key areas for gaining or maintaining overmatch earlier in the life-cycle. This 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. Red teaming informs requirements and helps accelerate acquisition pathways for joint missions. The Red Teaming project supports three broad types of red teaming: 1) Red Teaming for Technology Surprise supports early stage horizon scanning and assessments of weaknesses and opportunities of pre-development technologies from an adversary perspective; 2) Prototype Development for Demonstrations and Red Teaming supports targeted, low-fidelity prototypes to assess utility and inform design choices prior to funding commitments; and 3) Red Teaming to Support Innovation in Concepts of Operations including comprehensive 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, the Federally Funded Research and Development Centers (FFRDCs), government laboratories, and academia. Deliverables will inform technology acquisition and new concepts of operations.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
Title: Red Teaming to Support DoD Modernization Priorities	0.000	7.982	9.971
Description: This project funds red teaming 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 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, demonstration, experiments, and concepts of operations 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 Department of Defense 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 characterization of future prototypes, requirement definition, recommendations on system operational employment, potential vulnerabilities, and likely countermeasures taken by the threat as well as potential counter-countermeasures to increase functionality or operational effectiveness of the system. The Under Secretary of Defense for Research and Engineering will leverage these products to inform how technologies and integrated systems can perform in hostile environments and develop new concepts of operations.			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603699D8Z / <i>Emerging Capabilities Technology Development</i>	Project (Number/Name) 717 / <i>Red Teaming</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p><i>FY 2019 Plans:</i> The investment decisions for red teaming are made during the execution years in response to Department, Combatant Command, Service, and other government organization priorities and as new threats emerge or new opportunities are presented. This project anticipates funding five to ten efforts to investigate red and blue impacts to force structure and operations with the adoption of new technologies. Potential projects include experimentation with multi-payload electric vehicles and impacts on SOF operations; squad distributed EW capabilities and weakness; fleet operations with high-bandwidth over-the-horizon networked communications; emerging near-peer counters in the areas of fully networked, smart devices; quantum sensors; weakness in integrated air defense and missile defeat; and other potential counters to future U.S. technology investments. Project selection will be guided by the National Defense Strategy, 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.</p> <p><i>FY 2020 Plans:</i> The investment decisions for red teaming are made during the execution years in response to Department, Combatant Command, Service, and other government organization priorities, and as new threats emerge or new opportunities are presented.</p> <p><i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> The increase from FY 2019 to FY 2020 represents an increase in the overall efforts covered in this project line.</p>			
Accomplishments/Planned Programs Subtotals		0.000	7.982
C. Other Program Funding Summary (\$ in Millions)			
N/A			
Remarks			
D. Acquisition Strategy			
N/A			
E. Performance Metrics			
Project performance metrics for FY 2020 will include specific details to each effort and include measures identified in individual project plans. Project completions and successes are monitored against schedules and deliverables stated in the proposals and statements of work. The metrics include items such as target milestone dates, specific performance measures, fielding dates, and demonstration goals.			

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity					R-1 Program Element (Number/Name)							
0400: Research, Development, Test & Evaluation, Defense-Wide / BA 3: Advanced Technology Development (ATD)					PE 0603716D8Z / Strategic Environmental Research and Development Program (SERDP)							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	355.287	63.055	76.340	66.157	-	66.157	67.942	62.654	64.610	65.075	Continuing	Continuing
470: Strategic Environmental Research and Development Program (SERDP)	355.287	63.055	76.340	66.157	-	66.157	67.942	62.654	64.610	65.075	Continuing	Continuing

A. Mission Description and Budget Item Justification

Congress established the Strategic Environmental Research and Development Program (SERDP) in 1990 (10 U.S.C. Section 2901-2904) to address Department of Defense (DoD) and Department of Energy (DOE) environmental concerns. It is conducted as a DoD program, jointly planned and executed by the DoD, DOE, and the Environmental Protection Agency (EPA), with strong participation by other Federal agencies, industry, and academia. SERDP's objective is to improve DoD mission readiness and environmental performance by providing new scientific knowledge and cost-effective technologies in the areas of Environmental Restoration, Munitions Response, Resource Conservation and Resilience, and Weapons Systems and Platforms. SERDP does this by addressing high priority DoD environmental technology requirements. SERDP enhances military operations, improves military systems' effectiveness, enhances military training/readiness, sustains DoD's training and test ranges and installation infrastructure, and helps ensure the safety and welfare of military personnel and their dependents by eliminating or reducing the generation of pollution and use of hazardous materials and reducing the cost of remedial actions and compliance with environmental laws and regulations. As a secondary benefit, SERDP helps solve significant national and international environmental problems. The keys to a 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 constant technology transfer.

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	71.832	76.514	75.088	-	75.088
Current President's Budget	63.055	76.340	66.157	-	66.157
Total Adjustments	-8.777	-0.174	-8.931	-	-8.931
• Congressional General Reductions	-7.000	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-1.652	-			
• FFRDC	-0.125	-0.174	-	-	-
• Chemical Biological Defense Program	-	-	-2.481	-	-2.481
• Realign for A&S Core Mission	-	-	-6.450	-	-6.450

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400: Research, Development, Test & Evaluation, Defense-Wide / BA 3: Advanced Technology Development (ATD)	R-1 Program Element (Number/Name) PE 0603716D8Z / Strategic Environmental Research and Development Program (SERDP)	
Change Summary Explanation Changes in support of Chemical Biological Defense Program as well as other A&S core mission requirements.		

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
470: Strategic Environmental Research and Development Program (SERDP)	355.287	63.055	76.340	66.157	-	66.157	67.942	62.654	64.610	65.075	Continuing	Continuing

A. Mission Description and Budget Item Justification

Congress established the Strategic Environmental Research and Development Program (SERDP) in 1990 (10 U.S.C. Section 2901-2904) to address Department of Defense (DoD) and Department of Energy (DOE) environmental concerns. It is conducted as a DoD program, jointly planned and executed by the DoD, DOE, and the Environmental Protection Agency (EPA), with strong participation by other Federal agencies, industry, and academia. SERDP's objective is to improve DoD mission readiness and environmental performance by providing new scientific knowledge and cost-effective technologies in the areas of Environmental Restoration, Munitions Response, Resource Conservation and Resilience, and Weapons Systems and Platforms. SERDP does this by addressing high-priority DoD environmental technology requirements. Technologies developed by SERDP enhance military operations, improve military systems' effectiveness, enhance military training/readiness, sustain DoD's training and test ranges and installation infrastructure, and help ensure the safety and welfare of military personnel and their dependents by eliminating or reducing the generation of pollution and use of hazardous materials and by reducing the cost of remedial actions and compliance with environmental laws and regulations. As a secondary benefit, SERDP helps solve significant national and international environmental problems. The keys to a 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 constant technology transfer.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
Title: Environmental Restoration	12.828	22.624	18.485
Description: Environmental Restoration (ER) reduces DoD's liabilities by developing technologies for the cost-effective detection, characterization, containment, and remediation of contamination in soil, sediments, and water.			
FY 2019 Plans: New research initiatives will focus on the highest priority DoD requirements to reduce DoD's liabilities by developing technologies for the cost-effective detection, characterization, containment, and remediation of contamination in soil, sediments, and water. The planned increase will support projects related to the detection, quantification, treatment, and bioavailability of per- and polyfluoroalkyl substances.			
FY 2020 Plans: Continue the research into the detection, quantification, treatment, and bioavailability of PFAS (per- and polyfluoroalkyl substances). New projects will be initiated in "fingerprinting" for PFAS.			
FY 2019 to FY 2020 Increase/Decrease Statement:			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603716D8Z / <i>Strategic Environmental Research and Development Program (SERDP)</i>	Project (Number/Name) 470 / <i>Strategic Environmental Research and Development Program (SERDP)</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
Completion of initial projects on PFOS and PFOA contamination on DoD installations.				
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 2019 Plans: New research initiatives will focus on the highest priority DoD requirements in underwater UXO detection and protocols to reduce the costs associated with detecting, remediating, or managing UXO underwater with a focus on low-frequency acoustic imaging as a detection/classification system. Several projects will also be initiated aimed at constructing a physics-based model of munitions penetration on land to aid DoD project managers assess the suitability of competing remediation technologies. FY 2020 Plans: Detailed analysis of previously-collected low-frequency acoustic data to maximize value in the detection and identification of unexploded ordnance underwater. Two new projects initiated on the mobility and burial of munitions in muddy sediments (as contrasted to the sandy bottoms previously investigated). FY 2019 to FY 2020 Increase/Decrease Statement: Minor changes in the funding required for the ongoing acoustic system development projects.		7.435	10.962	9.729
Title: Resource Conservation and Resilience (RC) Description: Resource Conservation and Resilience (RC) develops the science and technologies required to sustain training and testing ranges. FY 2019 Plans: New research initiatives will focus on understanding wildfire initiation and spread to construct models to be used by installation natural resource managers in planning their managed fire programs, understanding the role of a changing environment on the management of threatened and endangered species, and resiliency initiatives for installations in the Arctic. FY 2020 Plans: In depth examination of the interplay of fire and threatened and endangered species will be continued. New efforts on the definition of a sustainable installation will be initiated. FY 2019 to FY 2020 Increase/Decrease Statement:		25.762	21.925	19.458

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603716D8Z / <i>Strategic Environmental Research and Development Program (SERDP)</i>	Project (Number/Name) 470 / <i>Strategic Environmental Research and Development Program (SERDP)</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
Several projects on the impacts of climate change on Pacific Island installations and the Southwest US have concluded.			
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 2019 Plans: New research initiatives will focus on jet engine noise measurement and control, additive manufacturing for battlefield applications, sustainable pyrotechnics, and corrosion assessment and prediction applied to DoD weapon systems. FY 2020 Plans: Initiation of a suite of projects on alternatives to Aqueous Fire Fighting Foam (AFFF) that do not contain fluorine. The current AFFF formulation is a major contributor to the PFAS contamination of DoD Installations. FY 2019 to FY 2020 Increase/Decrease Statement: A suite of projects focused on environmentally benign signal flares have concluded.		17.030	20.829
Accomplishments/Planned Programs Subtotals		63.055	76.340
C. Other Program Funding Summary (\$ in Millions)			
N/A			
Remarks			
D. Acquisition Strategy			
N/A			
E. Performance Metrics			
Performance in this program is monitored at two levels. At the lowest level, each of the more than 160 individual projects is measured against both technical and financial milestones on a quarterly and annual basis. At a program-wide level, progress is measured against DoD's environmental requirements and the development of technologies that address these requirements as well as the transition of these technologies to either to demonstration and validation programs or to direct use in the field.			

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: Research, Development, Test & Evaluation, Defense-Wide I BA 3: Advanced Technology Development (ATD)					R-1 Program Element (Number/Name) PE 0603727D8Z I Joint Warfighting Program							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	40.477	3.236	5.978	4.846	-	4.846	4.977	5.097	5.201	5.260	Continuing	Continuing
727: Joint Warfighting	40.477	3.236	5.978	4.846	-	4.846	4.977	5.097	5.201	5.260	Continuing	Continuing

A. Mission Description and Budget Item Justification

The Joint Warfighting Program (JWP) supports the Assistant Secretary of Defense for Acquisition, ASD(A)) responsibilities for acquisition and portfolio management analysis. These efforts include independent analyses, studies, limited scope experiments, wargaming, and partnerships with joint customers that define joint capability gaps and develop credible requirements for follow-on acquisition efforts. It synchronizes acquisition processes with corresponding acquisition requirements. These analyses and assessments deliver independent perspectives on ways to align investments and potential solutions for capability gaps created by future warfighting environments and emerging threats. JWP enables portfolio management through these assessments in order to promote potential acquisition remedies to these critical capability gaps. JWP supports efforts to: synchronize the acquisition processes with corresponding acquisition requirements to enable acquisition portfolio management; conduct mission thread analysis; define joint capability gaps and develop credible requirements for follow-on acquisition efforts; deliver independent perspectives on ways to align investments and potential solutions for capability gaps created by evolving threats; seize opportunities to partner with joint customers on projects that inform technology and acquisition decisions; and implement analytic projects on key joint warfighting mission areas and challenges.

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	6.349	5.992	5.028	-	5.028
Current President's Budget	3.236	5.978	4.846	-	4.846
Total Adjustments	-3.113	-0.014	-0.182	-	-0.182
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.232	-			
• FFRDC	-0.012	-0.014	-	-	-
• Other Reprogramming Actions in FY18	-2.869	-	-	-	-
• Biological and Chemical Threats	-	-	-0.182	-	-0.182
Preparedness Adjustment					

Change Summary Explanation

Joint Warfighting Program decrease by \$5.5M FY20-24 due to reorganization decisions.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 3					R-1 Program Element (Number/Name) PE 0603727D8Z / Joint Warfighting Program				Project (Number/Name) 727 / Joint Warfighting			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
727: Joint Warfighting	40.477	3.236	5.978	4.846	-	4.846	4.977	5.097	5.201	5.260	Continuing	Continuing

A. Mission Description and Budget Item Justification

The Joint Warfighting Program (JWP) supports the Assistant Secretary of Defense for Acquisition, ASD(A)) responsibilities for acquisition and portfolio management analysis. These efforts include independent analyses, studies, limited scope experiments, wargaming, and partnerships with joint customers that define joint capability gaps and develop credible requirements for follow-on acquisition efforts. It synchronizes acquisition processes with corresponding acquisition requirements. These analyses and assessments deliver independent perspectives on ways to align investments and potential solutions for capability gaps created by future warfighting environments and emerging threats. JWP enables portfolio management though these assessments in order to promote potential acquisition remedies to these critical capability gaps. JWP supports efforts to: synchronize the acquisition processes with corresponding acquisition requirements to enable acquisition portfolio management; conduct mission thread analysis; define joint capability gaps and develop credible requirements for follow-on acquisition efforts; deliver independent perspectives on ways to align investments and potential solutions for capability gaps created by evolving threats; seize opportunities to partner with joint customers on projects that inform technology and acquisition decisions; and implement analytic projects on key joint warfighting mission areas and challenges.

JWP projects will support identifying acquisition implication and remedies for critical warfighting challenge. These projects include a F-35 sustainment wargame to define the future state F-35 sustainment strategy that will enable DoD to realize readiness and sustainment goals; a Cyber wargame on cyber resiliency; analysis of the long term acquisition and sustainment implications of proliferated low-earth orbit constellations; evaluation of the feasibility and cost effectiveness of recent attempts to create open architecture for space systems; analysis/study of MUOS Cyber Study/Narrow-Band SATCOM and MUOS Enterprise Cyber to leverage the best of breed, best practices Cyber strategies and risk management approaches for prevention and detection of cyber threat activity; development of practical approaches to for game-changing software development and sustainment approaches that will catalyze greater mission impact to the warfighter while controlling cost and improving resilience; providing technical support to Software Provenance and Supply Chain Risk Management planning to mitigate risks of cybersecurity threats in DoD security systems and critical infrastructure from IT produces produced by adversaries; providing engineering /technical assistance for designated agile pilot programs, develop policy, procedures and best practices to facilitate DoD adoption of Agile Pilot Software Piloting methodology.

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 2018	FY 2019	FY 2020
Title: Acquisition Analysis for Joint Capability Requirements Addressing Evolving Threats/Missions	1.205	4.000	4.846
Description: The Joint Warfighting Program (JWP) supports the Assistant Secretary of Defense for Acquisition responsibilities for acquisition and portfolio management analysis. These efforts include independent analyses, studies, limited scope experiments, wargaming, and partnerships with joint customers that define joint capability gaps and develop credible requirements for follow-			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603727D8Z / Joint Warfighting Program	Project (Number/Name) 727 / Joint Warfighting	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>on acquisition efforts. It synchronizes acquisition processes with corresponding acquisition requirements. These analyses deliver independent perspectives on ways to align investments and potential solutions for capability gaps created by future warfighting environments and emerging threats. JWP enables portfolio management through these assessments in order to promote potential acquisition remedies to these critical capability gaps.</p> <p>FY 2019 Plans: Synchronize the Acquisition processes with corresponding acquisition requirement needs to enable acquisition portfolio management and mission thread analysis; define joint capability gaps and develop credible requirements for follow-on acquisition efforts; deliver independent perspectives on ways to align investments and potential solutions for capability gaps created by evolving threats not aligned to single Component missions; seize opportunities to partner with joint customers on projects that inform technology and acquisition decisions; and implement analytic projects on key joint warfighting mission areas and challenges.</p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> -F35 Sustainment Wargame. Define the future state F-35 sustainment strategy that will enable DoD to realize readiness and sustainment goals. Deliverables: Report to summarize the current F35 sustainment strategy, impediments to achieving the future state sustainment strategy with its corresponding readiness and affordability goals, and a plan of action to achieve goals. -Cyber Wargame. Conduct a joint wargame on cyber resiliency to identify gaps and remedies. Methodology will integrate systems engineering, and cyber vulnerability analysis with modeling and simulation. It includes a detailed analysis and assessment of vulnerabilities in a system of system architecture. -MOUS Cyber Study:Narrow-Band SATCOM and MOUS Enterprise Cyber Situational Awareness. Objective is to increase the cybersecurity posture of Internet Protocol based Military Satellite Communications systems. Study will leverage best of breed technologies and best practice cyber situational awareness strategies for prevention and detection of cyber threat activity. -Open Architecture Space Systems. Analysis/study will evaluate the feasibility and cost effectiveness to create open systems and software architectures for space situational awareness, management, and command and control of space systems. -Constellation Management for Proliferated Low-Earth-Orbit (PLEO) Missions. The objective is to analyze the long term acquisition and sustainment implications of proliferated low-earth orbit constellations, analyze C2 concepts/architectures for acquisition trade-offs and long term sustainability and assess survivability approaches to PLEO constellations. 			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603727D8Z / <i>Joint Warfighting Program</i>	Project (Number/Name) 727 / <i>Joint Warfighting</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<p>-Supply Chain Risk Mitigation. Support analysis for technical/engineering efforts to support software provenance and supply chain risk management to mitigate cybersecurity threats in DoD National Security systems and critical infrastructure from IT products produced by potential adversaries.</p> <p>- Agile Community of Practice. Study supports acquisition reform area of preparing for, and piloting the implementation of best practices for Agile software development. It will support efforts to complete agile pilots, develop policy, procedures, and best practices to facilitate DoD adaptation of Agile Software Piloting methodology.</p> <p>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.</p> <p>FY 2020 Plans: Conduct acquisition analysis through a portfolio management lens to address the critical joint warfighting mission areas critical to national Defense. Major focus and project areas will include a continuation of cyber wargaming on cyber security challenges, threats and resiliency of systems and infrastructure to identify gaps and remedies. The methodology in the wargame will integrate systems engineering, and cyber vulnerability analysis with modeling and simulation. It will include a detailed analysis and assessment of vulnerabilities in a system of system architecture; a follow-on analysis on space open architecture of space systems in order to improve space acquisition to support space strategic vision. The analysis/study will evaluate challenges to create open systems and software architectures for space situational awareness, management, and command and control of space system for acquisition and long term sustainment.. An electronic warfare analysis of capability gaps and potential remedies for operating in the future joint environment. A follow-on to the F35 sustainment wargame to refine the sustainment strategy, affordability and readiness and plan of action . An analysis of the challenges to nuclear command and control and the implications for acquisition and sustainment of NC2 systems. Efforts will continue to synchronize the Acquisition processes with corresponding acquisition requirement needs to enable acquisition portfolio management and mission thread analysis; define joint capability gaps and develop credible requirements for follow-on acquisition efforts; deliver independent perspectives on ways to align investments and potential solutions for capability gaps created by evolving threats not aligned to single Component missions; seize opportunities to partner with joint customers on projects that inform technology and acquisition decisions; and implement analytic projects on key joint warfighting mission areas and challenges.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement:</p>				

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603727D8Z / Joint Warfighting Program	Project (Number/Name) 727 / Joint Warfighting		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
Under the directed split of USD AT&L into USD (A&S) and USD (R&E), ASD(A) leadership adjusted funding and focus to address mission priority areas. In FY2020, this segment is combined with Acquisition Analysis of Joint Capability Requirements Addressing Evolving Threats/Missions				
<p>Title: Analytic Development of Joint Military Requirements Addressing Evolving Threats / Missions</p> <p>Description: This segment underwrites innovative, responsive and timely analytic development of Joint Military requirements addressing evolving missions and threats. It supports joint capability development serving the needs of joint warfighters in partnership with senior acquisition staffs. It provides an independent source to examine potential remedies for mission capability gaps and can establish a framework for subsequent field experiments, capability demonstrations or accelerated acquisition. Joint warfare independent analysis often represents the first effort to define alternative solutions across the range of Doctrine, Organization, Training, Material, Leadership and Personnel-Facilities. On a modest funding base, JWP forges collaborative analysis efforts across OSD and joint staffs to address tough DoD-wide issues like ISR, cyber, EW and UAS.</p> <p>FY 2019 Plans: This segment will provide independent analysis of joint issues and capability gaps. It will provide responsive and timely capability development pathways and recommendations for rapid acquisition, through wargames and analyses conducted by joint military staffs and units. It will provide an independent source for analysis and enable capability development suitable for joint experimentation undertaken by joint authorities.</p> <p>Specific Objectives: -F35 Sustainment Wargame. Define the future state F-35 sustainment strategy that will enable DoD to realize readiness and sustainment goals. Deliverables: Report to summarize the current F35 sustainment strategy, impediments to achieving the future state sustainment strategy with its corresponding readiness and affordability goals, and a plan of action to achieve goals. -Cyber Wargame. Conduct a joint wargame on cyber resiliency to identify gaps and remedies. Methodology will integrate systems engineering, and cyber vulnerability analysis with modeling and simulation. It includes a detailed analysis and assessment of vulnerabilities in a system of system architecture.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Under the directed split of USD AT&L into USD (A&S) and USD (R&E), ASD(A) leadership adjusted funding and focus to address mission priority areas. In FY2020, this segment is combined with Acquisition Analysis of Joint Capability Requirements Addressing Evolving Threats/Missions</p>		2.031	1.978	-
Accomplishments/Planned Programs Subtotals		3.236	5.978	4.846

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603727D8Z / <i>Joint Warfighting Program</i>	Project (Number/Name) 727 / <i>Joint Warfighting</i>
<p>C. Other Program Funding Summary (\$ in Millions) N/A</p> <p>Remarks</p> <p>D. Acquisition Strategy N/A</p> <p>E. Performance Metrics Performance is measured through metrics including (1) objective validation of enhanced CCMD capabilities to perform joint missions in their assigned theaters and areas of responsibility, (2) documented delivery effective joint operational concepts, (3) confirmed production of refined and validated capability descriptions.</p>		

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	10.384	11.053	13.564	13.723	-	13.723	13.493	13.204	12.425	12.425	Continuing	Continuing
776: Advance Distributed Learning (ADL)	10.384	11.053	13.564	13.723	-	13.723	13.493	13.204	12.425	12.425	Continuing	Continuing

A. Mission Description and Budget Item Justification

This Program Element (PE) describes the Advanced Distributed Learning (ADL) Initiative. This program was originally established in the 1990s in response to the NDAA (FY99, Section 378 of Public Law 105-261) and granted additional authorities via Executive Orders (e.g., EO 13111) and other supporting publications (e.g., 10 U.S. Code §2249d). The ADL Initiative supports innovation and provides policy oversight to help the Services, Joint Staff, and partner agencies deliver their training and education more efficiently and cost effectively—anytime, anywhere. ADL provides policy oversight and coordination across DoD, Coalition partners, and other Federal agencies for distributed learning. Ultimately, this work supports DoD’s training and education mission, increases personnel readiness, saves resources, ensures the right people receive the right training and education, at the right time, and at the right cost, and facilitates interorganizational interoperability. Organizationally, this PE reports to the Deputy Assistant Secretary of Defense for Force Education and Training (DASD(FE&T)).

This PE provides policy oversight and guidance for distributed learning (e.g., online courses, smartphone-based learning, web browser–based simulations) and supports associated innovation, modernization, and coordination across DoD, Coalition partners (e.g., NATO), and other federal agencies. This work focuses on distributed learning interoperability (i.e., ensuring interagency technical and organizational systems function together), supports interagency/interorganizational coordination for its implementation, and helps agencies acquire new distributed learning capabilities effectively and cost-efficiency.

This PE’s work falls into three interrelated categories: (1) Modernization, (2) Documentation, and (3) Coordination. The “modernization” work involves Advanced Technology Development (6.3) in technical areas such as e-learning, mobile learning, learner modeling and analytics, and software interoperability. These efforts inform the PE’s “documentation” work, including the authoring and upkeep of technical guidance and policy documents, such as DoD Instruction 1322.26 (“Distributed Learning”) and software interoperability specifications. Finally, the documentation work drives “coordination” efforts, which consist of implementation support and interagency/interorganizational coordination.

This PE’s modernization investments are driven by requirements collected from the Defense ADL Advisory Committee, a working group of military personnel and DoD/ federal civilians (at the O-6 and GS-15 level) who represent their agencies’ distributed learning equities and are key stakeholders in shaping the direction of these agencies (refer to DoDI 1322.26). These requirements are also aligned to DoD/federal strategic direction, such as the Army Learning Concept for Training and Education for 2020–2040 (TP 525-8-2), Navy’s Sailor 2025, and Air Force Strategic Master Plan, and they are considered against emerging industry trends and technologies.

This PE benefits DoD in three ways. (1) Interoperability: It strengthens interagency, interorganizational, and multinational interoperability by governing distributed learning interoperability policy, maintaining current technical reference guidelines, and fostering their implementation across communities of practice. (2) Efficiencies: It saves government resources by fostering unity of effort across DoD, other federal agencies, and Coalition Partners for distributed learning, eliminating duplications and identifying opportunities for interagency collaboration. (3) Learning Effectiveness: It helps improve training and education effectiveness by helping DoD, federal,

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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I</i> BA 3: <i>Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603769D8Z <i>I Advanced Distributed Learning</i>
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and Coalition stakeholders acquire and implement emerging distributed learning capabilities effectively and cost-efficiently. In sum, this work supports the components' training and education missions, helping them increase personnel readiness while driving down training and education portfolio costs.

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	11.157	13.564	13.723	-	13.723
Current President's Budget	11.053	13.564	13.723	-	13.723
Total Adjustments	-0.104	0.000	0.000	-	0.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.104	-			

Change Summary Explanation

Funds reserved for special research programs, e.g., SBIR/STTR.

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
Title: Advance Distributed Learning (ADL)	11.053	13.564	13.723
Description: This PE serves as the innovation hub for distributed learning across the DoD and other government agencies, enabling innovation, finding efficiencies, informing stakeholders' modernization efforts, and fostering interoperability across defense, government, and industry. ADL Initiative supports DoD-wide initiatives for innovation, modernization, and advancement of DoD enterprise-level online and mobile electronic training capability and learning tools. Activities include advanced technology design and development, demonstrations, assessments, and associated policy stewardship. Results improve efficiencies and reduce costs 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 2019 Plans: <ol style="list-style-type: none"> Continue implementation of revised DoDI 1322.26 requirements, while also providing coordination with Joint Services, and guidance on the incorporation of experience Application Programming Interface (xAPI) into distributed learning software systems. Total Learning Architecture – The Total Learning Architecture (TLA) will enter its third phase of development, which is expected to incorporate multiple simultaneous application domains, building upon the FY18 Combat Profiling domain. It will also incorporate 			

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C. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<p>increased focus on learner records, competency specifications, and content metadata, to enable greater integration with broader talent management systems. This work also coincides with emerging DoD-wide learning technology reform efforts.</p> <p>3. Learner Profiles – The promise of new TLA applications stems from the ability to create, collect, transmit, process, and archive information on a massive scale. Collaborate with operational defense training and education organizations to help them implement at-scale instances of prototype learning data interoperability specifications, learning analytics, and visualization capabilities. Desired outcomes include developing a TLA-compliant, extensible, and open-source learner profile for use within the DoD and Government.</p> <p>4. Competency and Credential Management - Coordinate efforts across defense and federal agencies for competency-based learning, with the associated technical guidance potentially informing DoD Instruction 1322.26's fungible technical references. Seek a robust set of data, metadata, and interaction specifications to represent competencies and competency frameworks. Desired outcomes include an effective reference implementation of enterprise competency and credential management supporting DoD learning ecosystems; including a data strategy and associated lifecycle that creates a solid foundation for expansion of TLA.</p> <p>5. Personal Assistant for Learning – Complete development cycles of tablet-based and web-based prototypes. Continue transition of mature specification into relevant technical guidelines and continue to investigate emerging capabilities. Initiate advanced research in preparation for immediate operational implementation of the PERvasive Learning System (PERLS), adaptive, micro-learning mobile application.</p> <p>6. Learning Science – Complete publication of a learning science scholarly book, summarizing best practices and specific guidance on modernizing training, education, and talent management, as an accompaniment to the emerging learning technologies.</p> <p>7. Interagency and Interorganizational Coordination – Continue coordination with defense, federal, and international stakeholders, and with relevant working groups, such as the Defense ADL Advisory Committee and NATO Training Group, to create technical alignment of distributed learning systems and find efficiencies for the government.</p> <p>FY 2020 Plans:</p> <p>1. Continue implementation of revised DoDI 1322.26 requirements, while also providing coordination with Joint Services, and guidance on the incorporation of xAPI into distributed learning software systems. Integrate research efforts and findings, as necessary into updates to the DoDI 1322.26.</p> <p>2. Total Learning Architecture – Research and development activities for this spiral of TLA will provide the ability to adapt across learning trajectories, careers, and experiences. It also incorporates various activity providers, as traditional e-learning content, a</p>				

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
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C. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
browser-based concept-map assessment application, e-book, micro-learning activities, a computer-based serious game, and a physical instructor-led learning activity. This work continues to coincide with the emerging DoD-wide learning technology reform efforts.				
3. Learner Science – Collaborate with operational defense training and education organizations to help them evolve effective learning methodologies and solutions. Implement prototype capability through empirical and theoretical analysis of neuroscience, cognitive science, instructional design, data analytics, anthropology, linguistics, computer science, psychology, and education. Use data and information to develop learning data interoperability specifications, learning analytics, and visualization capabilities. Ongoing efforts will also continue to inform the DoD Instruction 1322.26’s fungible technical references.				
4. Competency and Credential Management – Continue coordinate efforts across defense and federal agencies for competency-based learning, with the associated technical guidance potentially informing DoD Instruction 1322.26’s fungible technical references. Evolve a robust set of data, metadata, and interaction specifications to represent competencies and competency frameworks. Desired outcomes include evolution of an effective reference implementation of enterprise competency and credential management supporting DoD learning ecosystems; including refinement of a data strategy and associated lifecycle that builds on a solid foundation for expansion of TLA.				
5. Personal Assistant for Learning – PERvasive Learning System (PERLS) transition, sustainment and formalization as an R&D project subprogram. PERLS allows capitalization of “white space” outside of formal learning activities and training exercises.				
6. Interagency and Interorganizational Coordination – Continue coordination with defense, federal, and international stakeholders, and with relevant working groups, such as the Defense ADL Advisory Committee and NATO Training Group, to create technical alignment of distributed learning systems and find efficiencies for the government.				
FY 2019 to FY 2020 Increase/Decrease Statement: Delta between FY19-FY20 due to regular program growth/inflation				
Accomplishments/Planned Programs Subtotals		11.053	13.564	13.723
D. Other Program Funding Summary (\$ in Millions) N/A				
Remarks				
E. Acquisition Strategy N/A				

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
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	
F. Performance Metrics The primary objectives of this PE are to inform distributed learning modernization efforts, to develop associated policy and guidance documents, and to coordinate across distributed learning agencies to create technical alignment of distributed learning systems and find efficiencies for the government. MODERNIZATION: The modernization work consists of a collection of smaller technical efforts, each with project metrics that reflect their unique technical goals. Typical metrics include the advancement of related Technology Readiness Levels, the degree to which project investments are leveraged by other defense and federal agencies, the increase in the number of interoperable training and education digital systems, the impact of these efforts on defense/federal strategic planning, and downstream reductions in training and education portfolio costs. DOCUMENTATION: For the policy and documentation efforts, metrics include at-least annual update of published guidance, ensuring the documentation adheres to current technical/industry standards. The policy and documentation utility are also judged based upon its use, including both number of vendors adopting the policy and number of defense/federal acquisition efforts adhering to the guidance. COORDINATION: For the interagency and interorganizational coordination efforts, performance is first measured based upon the number of agencies, international organizations, and professional groups directly supported. Success is measured based upon the number of requirements consolidated across defense and federal stakeholders, an increase in partnering between agencies for distributed learning resource sharing, and, ultimately, in improved return on investment for distributed learning efforts.		

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 3: Advanced Technology Development (ATD)</i>					R-1 Program Element (Number/Name) PE 0603781D8Z I <i>Software Engineering Institute (SEI)</i>							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	14.468	15.016	15.111	-	15.111	15.239	15.400	15.688	16.020	Continuing	Continuing
781: <i>Software Engineering Institute (SEI)</i>	-	14.468	14.016	14.114	-	14.114	14.242	14.403	14.691	15.002	Continuing	Continuing
816: <i>Cyber Security</i>	-	0.000	1.000	0.997	-	0.997	0.997	0.997	0.997	1.018	Continuing	Continuing

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.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense				Date: February 2019	
Appropriation/Budget Activity		R-1 Program Element (Number/Name)			
0400: Research, Development, Test & Evaluation, Defense-Wide / BA 3: Advanced Technology Development (ATD)		PE 0603781D8Z / Software Engineering Institute (SEI)			
B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	15.047	15.050	15.154	-	15.154
Current President's Budget	14.468	15.016	15.111	-	15.111
Total Adjustments	-0.579	-0.034	-0.043	-	-0.043
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.550	-			
• FFRDC Adjustment	-0.029	-0.034	-	-	-
• Other Program Adjustments	-	-	-0.043	-	-0.043

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
781: Software Engineering Institute (SEI)	-	14.468	14.016	14.114	-	14.114	14.242	14.403	14.691	15.002	Continuing	Continuing
A. Mission Description and Budget Item Justification												
This program 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.												
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 2018	FY 2019	FY 2020	
Title: Software Engineering Institute Advanced Technology Development in the Area of Software Engineering, Systems Verification and Validation, and Mission Assurance									9.252	9.716	9.881	
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 will behave in untested environments. Increasingly, large numbers of lines of code will require a commensurate increase in sophisticated verification and validation mechanisms.												
FY 2019 Plans:												
• Develop and prototype full-lifecycle software cost models to assess/predict the cost DoD software acquisitions.												
• Develop a decision aid prototype that automatically guides DoD developers in refactoring code so that it can be harvested for re-use in a new system; select components could be replaced; or it could be upgraded to new hardware.												
FY 2020 Plans:												
• Develop methods and prototypes for verifying timing properties of software executing on multiple cores of a processor.												
• Develop a machine learning-based classifier that identifies security defects in software source code with a low error rate by analyzing the output of multiple source code analyzers.												
• Automate the fielding and deployment of machine learning algorithms on novel computing architectures to allow faster and cheaper software capabilities as well as the realization of performance improvements within the hardware.												
FY 2019 to FY 2020 Increase/Decrease Statement:												

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020
The increase in budget from FY 2019 to FY 2020 reflects additional resources required for prototype development.												
Title: Software Engineering Institute Advanced Technology Development in the Area of Information Assurance										5.216	4.300	4.233
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 2019 Plans: • Develop and test assurance frameworks and methodologies for Internet of Thing (IoT) devices, control nodes, and other intermediaries in DoD mission and edge systems. • Develop, test, and prototype ML enabled automated detection against research and military datasets and video; the prototypes will use unsupervised machine learning (ML) approaches that incorporate minimal, opportunistic analyst feedback and include means to continually verify underlying data.												
FY 2020 Plans: • Prototype verified enforcers that prioritize mission critical functions while assuring component behavior to enable use of unverified commodity software components in military autonomous systems												
FY 2019 to FY 2020 Increase/Decrease Statement: The decrease from FY 2019 to FY 2020 reflects minor budget fluctuations.												
Accomplishments/Planned Programs Subtotals										14.468	14.016	14.114
C. Other Program Funding Summary (\$ in Millions)												
Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost	
• BA 2, PE # 0602751D8Z: Software Engineering Institute Applied Research	8.614	9.279	9.580	-	9.580	9.662	9.760	9.811	10.019	Continuing	Continuing	
Remarks												
D. Acquisition Strategy N/A												
E. Performance Metrics • Transition of tools and practices for use in DoD programs of record to the DIB, and to a number of agencies and organizations sponsoring work.												

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603781D8Z / <i>Software Engineering Institute (SEI)</i>	Project (Number/Name) 781 / <i>Software Engineering Institute (SEI)</i>
<ul style="list-style-type: none">• Number of publications in refereed journals and peer reviewed reports.• Number of external research collaborations and interactions with the broader software engineering research community.• Adoption of coding standards and process techniques by standards bodies, working groups, and software/systems engineering organizations		

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 3					R-1 Program Element (Number/Name) PE 0603781D8Z / <i>Software Engineering Institute (SEI)</i>				Project (Number/Name) 816 / <i>Cyber Security</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
816: <i>Cyber Security</i>	-	0.000	1.000	0.997	-	0.997	0.997	0.997	0.997	1.018	Continuing	Continuing

A. Mission Description and Budget Item Justification
 SEI research focuses on the most significant and pervasive cybersecurity challenges within the DoD, such as the scalability and reliability of software assurance, supply chain risk management, validation of and trust in autonomous systems, human-computer and human-technology teaming and interaction, computing and communication at the tactical edge, and efficiency and performance of acquisition strategies and software development appropriate for a contested cyber environment.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020			
Title: Cyber Security	-	1.000	0.997			
Description: DoD network-centric and data-dependent autonomous systems are currently developed with a focus on function rather than security. This approach makes them particularly vulnerable to cyber attacks, a risk we seek to mitigate by developing, prototyping, and demonstrating new tools, technologies, and techniques to increase their cyber security.						
FY 2019 Plans: <ul style="list-style-type: none"> • Develop technologies and techniques for automated code repair. • Develop techniques and prototypes that automate the examination and analysis of binary malware code 						
FY 2020 Plans: <ul style="list-style-type: none"> • Prototype DoD specific secure DevOps process, to include integration of advanced techniques and mission requirements that exceed commercial industry norms and capabilities • Prototype methods to model and understand the cost and protection of cyber controls on complex computer systems allowing better choices for PMO/PEO in system development 						
FY 2019 to FY 2020 Increase/Decrease Statement: There is no change in the Cyber investment between FY 2019 and FY 2020. Note: the Cyber effort was funded in Project 781 in FY 2018.						
Accomplishments/Planned Programs Subtotals				-	1.000	0.997

C. Other Program Funding Summary (\$ in Millions)
 N/A

Remarks

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Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603781D8Z / <i>Software Engineering Institute (SEI)</i>	Project (Number/Name) 816 / <i>Cyber Security</i>
D. Acquisition Strategy N/A		
E. Performance Metrics <ul style="list-style-type: none">• Transition of tools and practices for use in DoD programs of record to the DIB, and to a number of agencies and organizations sponsoring work.• Number of publications in refereed journals and peer reviewed reports.• Number of external research collaborations and interactions with the broader software engineering research community.• Adoption of coding standards and process techniques by standards bodies, working groups, and software/systems engineering organizations		

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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 3: Advanced Technology Development (ATD)</i>					R-1 Program Element (Number/Name) PE 0603826D8Z <i>I Quick Reaction Special Projects (QRSP)</i>							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	405.164	64.775	59.490	47.147	-	47.147	48.828	49.600	49.990	51.077	Continuing	Continuing
826: <i>Quick Reaction Fund</i>	126.494	18.743	18.499	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
828: <i>Rapid Reaction Fund</i>	258.405	42.082	36.998	44.796	-	44.796	46.453	47.201	47.567	48.630	Continuing	Continuing
831: <i>Joint Rapid Acquisition Cell Support</i>	9.561	1.649	1.669	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
833: <i>Strategic Multi-Layered Assessment (SMA) Support</i>	10.704	2.301	2.324	2.351	-	2.351	2.375	2.399	2.423	2.447	Continuing	Continuing

Note

The Quick Reaction Special Projects (QRSP) Program Element (PE) will be adjusted to support the priorities of the Under Secretary of Defense for Research and Engineering (USD(R&E)). In FY 2020, this realignment includes a transfer of funding and appropriate project investment areas from the Quick Reaction Fund to PE 0603699D8Z Emerging Capabilities Technology Development. The remaining QRSP funding is focused on prototyping projects that are executed faster and explore higher risk concepts with the potential for immediate impacts to the Combatant Commanders and joint warfighters. Additionally, in FY 2020 the Joint Raid Acquisition Cell Support will be transferred to PE 0903399D8Z within the Office of the Under Secretary of Defense for Acquisition and Sustainment for alignment and execution.

Funding in the QRSP PE enables leadership within the Office of the Under Secretary of Defense for Research and Engineering (OUSD(R&E)) to anticipate and quickly respond to emergent Combatant Command (CCMD) issues and time-sensitive threats by selecting projects within the year of execution and incubating them to rapidly develop potentially game-changing capabilities. QRSP harnesses the national industrial bases by partnering with military Services, interagency partners, Federally Funded Research and Development Centers (FFRDC), academia, and traditional or non-traditional industry.

A. Mission Description and Budget Item Justification

The Quick Reaction Special Projects (QRSP) Program Element 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, DoD's modernization priorities, and the Combatant Commands' (CCMD) Integrated Priority Lists (IPLs).

The QRSP Program supports four major project codes that expedite development and transition of new capabilities to the warfighter. These project codes are: 1) Quick Reaction Fund (QRF), 2) Rapid Reaction Fund (RRF), 3) Joint Rapid Acquisition Cell (JRAC) support, and 4) Strategic Multi-Layered Assessment (SMA). Efforts within these project codes align to DoD science and technology priorities, address challenges identified in the National Defense Strategy, and support the DoD's modernization priorities.

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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)
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The QRF develops prototypes in response to emergent needs that take advantage of breakthroughs in rapidly evolving technologies and accelerate these innovations to the warfighter. The QRF program initiates prototyping projects during the execution year to mature technologies critically needed for the CCMDs and rapidly transition those capabilities. QRF projects are identified through current warfighter gaps, solutions proposed by CCMDs, and jointly applicable capabilities identified by the Services and Defense Agencies. In 2020, QRF funding to support prototyping or experimentation will be transferred to PE 0603699D8Z Emerging Capabilities Technology Development.

The RRF develops prototypes to counter emerging threats; anticipate adversaries' exploitation of new technologies; and, expedite 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 traditional industrial bases and non-traditional suppliers in the commercial sector, academia, international arenas, and small businesses.

The JRAC responds, in timeframes acceptable to the CCMDs, to Joint Urgent Operational Needs (JUON) and Joint Emerging Operational Needs (JEON) that are submitted by CCMDs and validated by the Joint Staff. To meet these objectives, JRAC leverages contingency and other rapid acquisition authorities. In 2020, the Joint Rapid Acquisition Cell Support will transfer to PE 0903399D8Z.

The 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. Priorities for SMA programs are set by the Joint Staff Deputy Director for Global Operations (DDGO). SMA products are typically generated within six to nine months and directly contribute to the decision-making process of the Joint Staff and CCMD senior leadership.

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	69.203	69.626	71.393	-	71.393
Current President's Budget	64.775	59.490	47.147	-	47.147
Total Adjustments	-4.428	-10.136	-24.246	-	-24.246
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-10.000			
• Congressional Rescissions	-	-			
• Congressional Adds	3.000	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-2.298	-			
• Congressional Reduction	-5.000	-	-	-	-
• FFRDC Adjustments	-0.130	-0.136	-	-	-
• Other Program Adjustments	-	-	-0.109	-	-0.109

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I</i> BA 3: <i>Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603826D8Z / <i>Quick Reaction Special Projects (QRSP)</i>
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• Quick Reaction Fund (QRF) Realignment	-	-	-22.452	-	-22.452
• Joint Rapid Acquisition Cell (JRAC) Realignment	-	-	-1.685	-	-1.685

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

Project: 828: *Rapid Reaction Fund*

Congressional Add: *Solar Energy Research*

Congressional Add Subtotals for Project: 828

Congressional Add Totals for all Projects

FY 2018	FY 2019
3.000	-
3.000	-
3.000	-

Change Summary Explanation

The FY 2018 decrease is the net of a \$3.000 million Congressional increase for Solar Energy Research, a \$5.000 million Congressional reduction for prior year carryover, and required FFRDC and SBIR/STTR adjustments.

The FY 2019 Congressional decrement was for efficiencies and prior year carryover.

The 2020 baseline reduction is the net of the transfer out of the Quick Reaction fund to Emerging Capabilities Technology Development (Program Element 0603699D8Z) to support Prototyping, and the transfer out of the Joint Rapid Acquisition Cell to an Operations and Maintenance Program Element (0903399D8Z) within the Office of the Under Secretary of Defense for Acquisition and Sustainment (OUSD(A&S)) for proper alignment and execution.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 3					R-1 Program Element (Number/Name) PE 0603826D8Z / Quick Reaction Special Projects (QRSP)				Project (Number/Name) 826 / Quick Reaction Fund			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
826: Quick Reaction Fund	126.494	18.743	18.499	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

Note

In FY 2020, the Quick Reaction Fund is transferred to Program Element 0603699D8Z (Emerging Capabilities Technology Development).

A. Mission Description and Budget Item Justification

The Quick Reaction Fund (QRF) provides the Combatant Commands (CCMDs), Services and joint warfighters opportunities to capitalize on relatively mature technologies to rapidly prototype and field-test promising new prototypes that can have immediate impact on time-sensitive operational needs. New capabilities address National Defense Strategy priorities and inform programs of record or new acquisition pathways to more effectively and affordably push innovation to the field. QRF focuses on projects that have the potential to address conventional, disruptive, and asymmetric warfare needs. QRF initiatives typically deliver a prototype application within 12 months of being funded.

In FY 2019, QRF identifies and funds prototypes that respond to critical operational needs and emerging threats. QRF projects are selected in the year of execution based on Department, CCMD, Service, and other government organization identified threats and opportunities. In FY 2020, QRF funds will transfer to PE 0603699D8Z Emerging Capabilities Technology Development to facilitate prototyping and experimentation to support the DoD's modernization priorities.

Recent success stories and significant transitions of note include:

- **Talon Archer:** This project prototyped novel sensors capable of passively detecting nation-state assets at extended ranges. The project demonstrated these novel sensors at key locations to provide indications and warnings in defense of the homeland. The information from the Talon Archer sensors will be sent to national organizations in near-real time to inform decision makers. Talon Archer transitioned to support a classified mission in the U.S. Northern Command area of responsibility. Additional details are classified.
- **Isosceles:** This project prototyped an on-demand experimentation capability that provides high-fidelity results for understanding whether certain strategic systems meet their performance thresholds and goals. Isosceles removes the need to use dissimilar surrogates during system evaluations, significantly improving the quality and accuracy of the evaluations. Isosceles transitioned to a classified program of record in 2018.
- **Sidecast:** This project deployed a prototype set of fully customizable government-off-the-shelf tools for network exploitation. The solution leverages government best practices and expands DoD's capability to operate with customized software tools. Sidecast enhances the Combatant Commands' capability to operate and exploit network information in near real time. With this capability, the warfighter has tools designed for open network exploitation for a fraction of the cost of existing programs. Sidecast transitioned to a classified customer within the U.S. Central Command area of responsibility.
- **Hammerhead:** This project responded to the need for more available courses of action in the event of certain space systems contingencies. The OSD project team and the Space Systems Defense Program (SSDP) transitioned Hammerhead to an operational capability. Additional details are classified.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
Title: Dead Center	0.400	-	-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense			Date: February 2019		
Appropriation/Budget Activity 0400 / 3		R-1 Program Element (Number/Name) PE 0603826D8Z / <i>Quick Reaction Special Projects (QRSP)</i>		Project (Number/Name) 826 / <i>Quick Reaction Fund</i>	
B. Accomplishments/Planned Programs (\$ in Millions)			FY 2018	FY 2019	FY 2020
Description: The previously-funded Dead Center project demonstrated advanced, highly tailorable algorithms to meet critical warfighter mission needs in multiple domains, culminating in a user demonstration of the advanced algorithms designed to enhance warfighter effectiveness. The project integrated these algorithms with repurposed commercial-off-the-shelf hardware to demonstrate a flexible, multi-platform functionality in a low size, weight, and power form factor to meet specific, highly tailored mission critical needs. Project deliverables, including prototypes and system documentation, transitioned to a classified DoD partner.					
Title: Vintage Racer Description: The previously-funded Vintage Racer project matured an advanced capability to prosecute targets of interest. This project validated aerodynamic design with wind tunnel testing. Vintage Racer also prototyped and integrated a guidance subsystem for targeted kinetic effects. Due to a phased program plan, Vintage Racer was completed with FY 2018 funding. Following subsystem integration, FY 2018 funding supported a flight demonstration in FY 2019. The project supported a key modernization cross-functional team, and will transition documentation and prototype technologies to the U.S. Army for additional development and follow-on acquisition activities.			1.200	-	-
Title: Predictive Analytics for Condition Based Maintenance Description: This adaptive logistics project demonstrated the ability to apply a predicative analytics model for maintenance on ground combat equipment to enhance lethality through improved readiness. The prototype system collects and stores engine performance data and fault codes, applies machine learning principles to collected data, and anticipates required maintenance before issues cause expensive damage to engine hardware. Prototyping focused on building a framework to understand engine data from the M-88 platform and extrapolating actionable steps. The prototype transited to the U.S. Marine Corps for further development and assessment. This prototype also supports the M-1 tank chassis and was leveraged by the Army tank fleet and future systems that have onboard processing to run machine learning algorithms.			1.400	-	-
Title: Quantum Processor (Q-Pro) Chip Description: This project leveraged work done at the National Institute of Science and Technology and Sandia National Laboratory to create a unique quantum circuit with potential game-changing impact across several crucial DoD applications including artificial intelligence, complex problem optimizations, and big data search and sorting. Using FY 2018 funding, this project will demonstrate the quantum circuit in FY 2019. Additional details are classified.			2.900	-	-
Title: Air Field in a Box Description: This project demonstrated autonomous multiple UAS delivery, including extra-small variants that have sufficient capacity and scalability to satisfy the demands of future distributed expeditionary operations. The objective of this project			1.200	-	-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603826D8Z / Quick Reaction Special Projects (QRSP)	Project (Number/Name) 826 / Quick Reaction Fund		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
is to revolutionize logistics as necessary for survival in a decentralized battle space defined in Expeditionary Advance Base Operations, Distributed Lethality, and the Multi-Domain Battle concepts. Using FY 2018 funding, Air Field in a Box will complete a flight demonstration and user assessment in FY 2019. The resulting prototype demonstrates a concept that will transition into a full scale multi-UAS delivery system to be employed from the universal dimensions of International Organization for Standardization (ISO) containers. The ISO's intermodal and global reach will allow for standardized distribution through global supply chains and rugged field readiness no other unit or container offers.				
<p>Title: Hardware/Software (HW/SW) Assurance and Integrity Analysis</p> <p>Description: The Department of Defense has developed a trusted systems strategy including focusing efforts on mission assurance, comprehensive protection planning, industry standards, and advancing DoD's capability to identify and mitigate HW/SW vulnerabilities through science and technology. These HW/SW Assurance projects directly support all elements in the 2014 National Defense Authorization Act Section 937. This program established the Joint Federated Assurance Center (JFAC) that federates hardware and software assurance expertise and capabilities throughout DoD and makes the capabilities directly available to programs.</p> <p>The JFAC provides tools, services, best practices, contract language, and other help to programs that detect, assess, prioritize, and mitigate mission critical vulnerabilities to malicious software attacks and supply chain exploitation vulnerabilities. This collaboration helps mitigate existing and emerging critical threats and vulnerabilities in both SW and HW and yields secure architecture and design patterns available to all DoD programs. In FY 2018, JFAC incorporated Defense Advanced Research Projects Agency and Defense Acquisition University products into the JFAC website and developed a software assurance (SwA) guidebook to aid implementation of SwA practices in DoD programs. This project also supports Trusted and Assured Microelectronics Program Elements 0604294D8Z BA4 and 0605294D8Z BA5, which provide funding to demonstrate these capabilities and augment the hardware assurance capabilities of the JFAC.</p>		2.000	-	-
<p>Title: Crossed Arrows</p> <p>Description: This project demonstrated advanced machine learning (ML) algorithms and tools to address threats from near-peer adversaries. Crossed Arrows supports the increased lethality against a classified threat set by leveraging advances in predictive analytics. Using FY 2018 funds, Crossed Arrows successfully demonstrated ML tools and techniques that will transition in late FY 2019 to a classified customer.</p>		1.543	-	-
<p>Title: Olympus</p> <p>Description: This classified project demonstrated techniques to address threat finance networks by exploiting network, communication, and protocol vulnerabilities. Using FY 2018 funds, Olympus identified key technologies and demonstrated a</p>		1.600	-	-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603826D8Z / <i>Quick Reaction Special Projects (QRSP)</i>	Project (Number/Name) 826 / <i>Quick Reaction Fund</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
prototype capability against representative threat networks. Leveraging partner funding, Olympus will transition to a classified customer in FY 2019.				
Title: Rustam Relief Description: This project demonstrated an advanced analytics and data visualization tool to accelerate key decision making processes for the warfighter. Rustam Relief enables quicker responses and shortens the kill chain for time sensitive targets. Leveraging FY 2018 funding, Rustam Relief demonstrated new prototype tools against a representative threat and transitioned to a classified customer to inform future development.		1.500	-	-
Title: Battle Axe Description: This nine month effort leveraged existing commercial and mature technologies to prototype and demonstrate a new electronic-attack capability for ground vehicles. Battle Axe significantly reduces size, weight, power, and cost (SWaP-C) to provide a rapidly deployable counter intelligence, surveillance, and reconnaissance (ISR) solution to the warfighter. In 2018, Battle Axe integrated mature technologies in the areas of radar detection and classification and low SWaP-C solutions for electronic attack into a prototype to achieve sensor degradation, denial, and deception. Leveraging FY 2018 and partner funding, Battle Axe will demonstrate over-the-air range test against threat surrogates in FY 2019 and transition to the U.S. Army Vehicle Protection System program.		1.400	-	-
Title: High Performance, Versatile Iodine Platform-Enabled Reference (VIPER+) Description: This project integrated two molecular iodine clocks for demonstration and immediate deployment in DoD platforms that require precise timing and synchronization in GPS-denied environments. The VIPER+ iodine technology provides superior performance to currently available optical clocks in the same class with reduced SWaP-C resulting from a simplified architecture. The high-performance VIPER+ prototype architecture will support ground-based pseudo-satellites for positioning, coherent radar/LiDAR, electronic warfare (EW), and electronic intelligence in a package compatible with covert operations. Using FY 2018 funding, VIPER+ designed a new optical clock physics package and conducted laboratory testing. Partner funding will support additional system integration in FY 2020 before transitioning for test and validation.		3.600	-	-
Title: Quick Reaction Prototypes to Support DoD Modernization Priorities Description: This effort provides quick wins through rapidly fielded prototypes to address current or emerging threats and leverage new opportunities. Funded prototypes will provide capabilities critical to the National Defense Strategy and DoD's modernization priorities. Example technology areas include fully networked command, control, and communications; space; autonomy; hypersonics; microelectronics; cyber; quantum science; directed energy; and machine learning systems. Projects under consideration include countermeasures to monitor and, as needed, gain access to, or operate within, geographical areas		0.000	18.499	-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603826D8Z / <i>Quick Reaction Special Projects (QRSP)</i>	Project (Number/Name) 826 / <i>Quick Reaction Fund</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>that have been strategically denied; prototypes that leverage machine learning to provide advanced indications and warning (I&W); and, ad hoc sensors networks for reliable communications and collaboratively networked electronic effects. 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.</p> <p><i>FY 2019 Plans:</i> FY 2019 QRF efforts will mature concepts and designs to quickly address challenges within the DoD's modernization priorities. While project determinations are generally made in the year of execution, QRF anticipates funding six to nine projects that address gaps in the joint Services' investments. Potential areas to investigate include advanced sensors; machine learning for faster response; and, automated target recognition. Projects will be selected through coordination with the DoD, Federally Funded Research and Development Centers, other government agencies, industry, and academia.</p> <p><i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> In 2020, the Quick Reaction Fund (QRF) funding and appropriate focus areas will transition to PE 0603699D8Z Emerging Capabilities Technology Development. FY 2019 projects will be completed and transition within 12 months from project initiation.</p>			
Accomplishments/Planned Programs Subtotals		18.743	18.499
C. Other Program Funding Summary (\$ in Millions)			
N/A			
Remarks			
D. Acquisition Strategy			
QRF leverages the Services' and Defense Agencies' most efficient and effective acquisition approach for rapid prototyping. This includes using Other Transaction Authorities and new or existing contract vehicles.			
E. Performance Metrics			
Although the Quick Reaction Fund (QRF) will transition to PE 0603699D8Z, previously selected projects support the FY 2020 performance metrics to transition projects that address Joint Force and Combatant Command capability gaps. In FY 2018, QRF transitioned seven prototypes, with an overall transition rate of 100 percent. All QRF projects are monitored for schedule deviation, transition outcome, and deliverables such as advanced algorithms, hardware, and other components.			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
828: Rapid Reaction Fund	258.405	42.082	36.998	44.796	-	44.796	46.453	47.201	47.567	48.630	Continuing	Continuing

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 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. These lower-cost prototypes and innovative business processes give the 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 2019 and FY 2020, RRF will continue to support the Under Secretary of Defense for Research and Engineering and provide a hedge against technology risk by identifying and delivering near-term capabilities to support irregular warfare operations. Focus areas for RRF include: disparate data fusion; autonomous systems and behaviors; urban characterization for enhanced lethality; prototypes for interconnected sensors and command networks; novel manufacturing to rapidly field prototypes; and, novel applications of repurposed commercial-off-the-shelf and government-off-the-shelf technologies.

Recent success stories and significant transitions of note include:

- High Accuracy Video Object Classification (HAVOC): A prototype system that provided an automated, machine learning enabled, target recognition capability for expeditionary forces using a desktop computer. HAVOC transitioned to an intelligence community partner in 2018, and HAVOC technologies have been incorporated into Project Maven.
- Wide-area Infrared System for 360-Degree Persistent (WISP) surveillance: WISP prototyped and implemented a long-wave infrared hemispherical sensor for surveillance and tracking of moving objects. This effort supports the counter-unmanned aerial systems mission by expanding the sensor's field of view to 90 degrees elevation and refining the detection algorithms for the new targets. WISP transitioned to the U.S. Air Force.
- Future Infrared Search and Track (FIRST): FIRST created a novel method of building optical sensors capable of staring over a wide field of view with high resolution. The advantages of this method include producing an image with more pixels than the focal plane array, decoupling the field of view from the aspect ratio of the focal plane, and extending the field of view beyond the optical design. The FIRST prototype transitioned to the Air Force Research Laboratory and the Office of Naval Research for follow-on testing, development, and deployment.
- Social Network Aided Geolocation (SNAG): SNAG prototyped a suite of automated machine learning algorithms that accurately estimate geolocations for social media messages from location-indicative terms and metadata features. This capability provides location estimates for the large volume of social media content that is not

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
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		
explicitly geotagged. Geospatial analysis of social media has proven effective for identifying and tracking actors of interest as well as understanding local concerns and sentiments within an area of interest. SNAG transitioned to the Defense Intelligence Agency’s GOSSIP architecture, which is widely used across the intelligence community.				
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
Title: Low Cost Innovative Projects (Projects less than one million dollars each)		29.982	-	-
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 2018, RRF selected, executed, and transitioned multiple low cost projects, including: <ul style="list-style-type: none">• Miniature Ultra-Wideband (UWB) Radars for Real-Time Through-Obstacle Imaging: A miniature (less than 1 lb.) UWB radar capable of detecting stationary individuals behind walls. The resulting prototypes transitioned to U.S. Army Special Operations Command and the Army Research Laboratory.• Solid Oxide Fuel Cell (SOFC): A 350 watt (W) SOFC suitable as a drop-in replacement for the 245W SOFC currently used in an operational small unmanned aerial system. The prototype fuel cell will provide approximately 40 percent more power with better size, weight, and cost characteristics when compared to the current 245W SOFC. The prototype transitioned to U.S. Army Special Operations Command and U.S. Marine Corps Special Operations Command.• Electromagnetic Metamaterials: An electromagnetic meta-surface for operationally relevant objects. The meta-surface for the demonstration object was designed using electromagnetic modeling, simulation, and performance predictors and allowed the object to be compared to a control item to demonstrate the difference in performance characteristics. This technology transitioned to the U.S. Air Force and U.S. Navy PEO Unmanned Small Combatants. Additional details are classified.• Storm: A mid-body warhead capable of mechanically changing shape in terminal flight to direct all of the fragmentation toward the target. The prototyped warhead uses an airbag inflation system to propel warhead sections to the forward orientation, effectively directing all the fragments forward while bypassing the guidance material. This prototype transitioned to the U.S. Navy Precision Strike Weapon Office (PMA-201) and U.S. Special Operations Command.• Autonomous Sling Load Cargo Delivery: This prototyping project added a sling load capability to the government-owned Autonomous Aerial Cargo/Utility System architecture. This capability was first demonstrated with a Navy Explosive Ordnance Disposal mission and then with a U.S. Marine Corps cargo transport demonstration. This prototype transitioned to the U.S. Navy’s PMA-266 for integration into the MQ-8C Firescout program of record.• Extending Communication beyond Line-of-Sight: This project integrated and demonstrated an unmanned parafoil system with an unmanned surface vessel to extend digital communications and sensor connectivity beyond current line-of-sight limitations. This prototype transitioned to the U.S. Navy.• Eminent Tower: This project leveraged advances in mobile cognitive radio frequency technologies to port existing electronic warfare capabilities from large fixed-site facilities to mobile systems. The Eminent Tower prototype transitioned to the Joint Counter Radio-Controlled Improvised Explosive Device Electronic Warfare program.				

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Appropriation/Budget Activity 0400 / 3		R-1 Program Element (Number/Name) PE 0603826D8Z / <i>Quick Reaction Special Projects (QRSP)</i>		Project (Number/Name) 828 / <i>Rapid Reaction Fund</i>	
B. Accomplishments/Planned Programs (\$ in Millions)			FY 2018	FY 2019	FY 2020
<ul style="list-style-type: none"> • Joint Advanced Video Activity Analytics (AVAA) Workflows: A capability for the rapid exploitation of video imagery. AVAA enables analysts to rapidly assemble automated analysis workflows using custom computer vision algorithms as building blocks. AVAA building blocks include automated video enhancement (stabilization, de-hazing, etc.), scene classification, automatic object identification, and object and anomaly tracking. The capability deployed as an operational prototype in the U.S. Africa Command area of responsibility. • Solid State Pulsed X-Ray Generator: A prototyped compact solid-state pulsed X-ray generator for use by explosive ordnance disposal personnel. The prototype provides detailed images of the interior of IEDs while significantly improving accuracy and speed. The prototype transitioned to Joint Service Explosive Ordnance Disposal program. • Advanced Persistent Malware Threat Intrusion Protection Tool: A prototype computer network intrusion protection system to detect, quarantine, and report attacks on DoD and defense industrial base computer networks before the attack can take effect. This capability transitioned to a DoD Crime Center. • Spatially Selective Electronic Attack: A capability to target electronic warfare effects to a small geographical region, and reduce impact on neutral or partner forces. This prototype transitioned to a classified customer. • Facial Recognition at Extreme Distances (FRED): A suite of algorithms that leverages existing camera systems in the DoD inventory. FRED enables operators to perform non-cooperative surveillance with the ability to detect, track, and recognize persons of interest, and match them against the DoD watch list. This technology transitioned to Product Manager Force Protection Systems. • Single Sweep: Novel algorithms to process raw radar data from existing radars and identify unmanned aerial vehicles in real time. This prototype transitioned to the Navy's Fleet Forces Command. • Automation for Strategic Target Deployability: This prototyping project enabled the automated and timely mapping of key infrastructure at scale using commercial imagery, and transitioned to a classified partner. Further details of this project are classified. • Aqueous Li-ion Batteries: An aqueous lithium ion (Li-ion) battery prototype that is flexible and inherently safe. The battery uses a water-in-salt polymer electrolyte with a wide electrochemical stability window, providing energy storage comparable to conventional organic-based Li-ion batteries with increased safety. The aqueous Li-ion battery prototype transitioned to U.S. Army Special Forces for follow-on development. • Vector GEO: An instantaneous line of bearing system for radio frequency signals from an airborne platform. The front end is a small six-axis electric (E-field) and magnetic (B-field) sensor that can provide geolocation within 100 meters from operational standoffs and altitudes. This prototype transitioned to the U.S. Army Special Operations Command. • Russian Gray Maritime Networks: A prototype capability to identify and track agents and members (vessels, owners/operators, port facilities, cargoes) of the Russian gray maritime network that could be activated during hybrid or gray zone warfare in the Baltic. The prototype transitioned to Sealink Advanced Analysis office at the Naval Research Laboratory. • Concealable Flexible Buoyant Body Armor: A concealable and flexible body armor system using low-cost, commercial-off-the-shelf components that protects the warfighter from small arms rounds up to 7.62x51 mm rifle rounds (National Institute of Justice 					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>(NIJ) level III threats). The body armor incorporates ceramic spheres encapsulated in a lightweight polyurea foam, resulting in a lightweight solution with flexibility, neutral buoyancy, and a multi-hit capability. After a successful demonstration, the prototype transitioned to the Air Force for further maturation.</p> <ul style="list-style-type: none"> • Remote Runway Clearing Lidar: A prototyped and demonstrated sensor for scanning potential unimproved runways for gradients, undulations, and obstructions using lidar mounted on a class 1 unmanned aerial system. The system transitioned to U.S. Air Force Special Operations Command. • Tamper Resistance: A standalone anti-tamper chip providing device authentication and encryption using physically unclonable functions. The resulting prototype is a physical security technology for microelectronics, which is highly resistive to reverse engineering. This effort transitioned to U.S. Naval Air Systems Command. • Multistatic Operationally Distributed Sonar System (MODSS): A modeling and simulation capability that uses already-available data to optimize the design of an active sonar system for harbor defense from underwater threats. The resulting prototype system transitioned to U.S. Naval Forces Central Command for field evaluation. • Ordnance Threat/Target Automated Recognition (OTTAR): Computer vision analytics that enable the explosive ordnance disposal (EOD) warfighter to quickly and accurately identify military ordnance during the reconnaissance phase of unexploded ordnance response missions. This capability was successfully demonstrated and transitioned to Joint Service EOD Program. • Soldier Borne Sensor – Autonomy in Complex Environments (SBS - ACE): Autonomy algorithms that enable a very small unmanned aerial system to autonomously avoid obstacles while flying through complex terrain. These government owned algorithms use onboard electro optical/infrared sensors to fit the platform agnostic, multiple fly-off model of the SBS program. After a successful demonstration, this project transitioned to Product Manager – Soldier Maneuver Sensors via integration with the SBS program. • Multispectral Augmented Visually Enhanced Reality Imaging Capability (MAVERIC): A light-weight, multispectral binocular system for long-range intelligence, surveillance, and reconnaissance. The handheld system is built around the state-of-the-art Defense Advanced Research Projects Agency Pixel Network for Dynamic Visualization and integrates augmented reality graphics into the display. MAVERIC interfaces with Android Tactical Assault Kits, enabling the user to transfer tactically relevant graphics while keeping eyes on the target. This capability transitioned to U.S. Special Operations Command Program Executive Office Special Operations Force Warrior. • Multi-Mission Hybrid MRZR-4: This project matured and validated the operational prototype of a Hybrid Tactical All-Terrain Vehicle (ATV) MRZR-4. Early technology demonstrators were developed for fully electric and hybrid technology on a tactical ATV. This effort merged these two tech demonstrators into a final operational design on tactical MRZR-4 using commercial off the shelf parts. This project transitioned to United States Special Operations Command. • Autonomous Tactical Combat Casualty Care Under-Layer: A modular, sensor-infused garment to provide instantaneous notification of penetrating wounds to battlefield medics. The prototype transitioned to United States Special Operations Command. 			

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<ul style="list-style-type: none"> • SLING Blade: A low cost hybrid commercial Ka-band satellite terminal that is interchangeable among ground, maritime, and airborne vehicles with little to no adjustments. After a successful demonstration, the prototype transitioned to United States Special Operations Command. • Data Collection / Exfiltration Point for Sensitive Site Exploitation (SSE): This project developed algorithms and targeted integrations into SSE workflows to accelerate the collection, prioritization, and movement of extracted data. After a successful demonstration, this prototype transitioned to United States Special Operations Command's Sensitive Site Exploitation office. • Mobile Power Meter (MPM): A non-intrusive palm-sized electrical load monitor that untrained soldiers can safely install on active power cables. The system is used for real-time power monitoring of multi-conductor cables in tactical microgrids. The prototype transitioned to Project Manager Expeditionary Energy & Sustainment Systems. • Prototype Model for Towed Glider Air Launch System (TGALS): A prototype design for a towed launch system to provide a low-cost, operationally responsive space launch alternative for small satellite payloads or hypersonic test vehicles. The design parameters transitioned to inform for further development addressing missions in the U.S. Indo-Pacific Command area of responsibility. • High Performance Nano-Coating For Diesel Engines: A prototype coating for heat-exchangers in maritime diesel engines and land-based diesel generators. The nano-coating protects against bio-fouling build up and provides an immediate improvement in heat transfer, thereby increasing the engine's efficiency and performance. The prototype was tested at sea on the Stiletto maritime demonstration platform before transitioning to the Navy's PMS 443 Surface Ship Readiness and Sustainment Program. • Concurrent Engineering Interface Testbed Amphibious Combat Vehicle: This effort adapts a concept for concurrent engineering to demonstrate reduced cost and quicker development for complex military systems. The project developed algorithms and integrated models to enable rapid exploration of design trade space and identify potential problems with engineering design choices prior to committing development resources. The concept was tested on a joint-U.S. Marine Corps-Japanese amphibious combat vehicle design. • Malware Defense Applications: This project adapted a commercial endpoint solution as an on-demand malware classifier and evaluated performance on DoD systems. The project also experimented with an automated machine learning model-building solution for classifying events and malware metadata. The capabilities transitioned to the U.S. Navy. • Helios Airborne System: An advanced hyperspectral prototype imaging sensor on a Group 1 unmanned aircraft system (UAS) with sensor outputs integrated into the Android Tactical Assault Kit environment. After demonstrating in a relevant environment the sensor transitioned to Naval Special Warfare Development Group. • Digital Data Linkage Tool Phase 2: A prototype that enables an analyst exploiting a digital device to identify other devices associated with the same user, by identifying common access to cloud-based services. This capability transitioned to the National Media Exploitation Center and DoD forensics components. • Miniature Ultra Wideband (UWB) Radio: A miniature ultra-wideband (UWB) antenna capable of operating from 100 MHz to 50 GHz. The extended frequency range provided by this front-end allows multiple radios to be replaced by a single software defined radio. This prototype transitioned to U.S. Army Special Operations Command. 			

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<ul style="list-style-type: none"> Special Operations Forces (SOF) Combat Diver Communications: A suite of optical and acoustic communications systems that enable high-bandwidth communications for submerged combat divers. This prototype transitioned to U.S. Special Operations Command Program Executive Office Maritime. Fuel & Coupler for Hard and Deeply Buried Targets: This experimentation demonstrated the suitability of fueling Special Operations Forces operators with a ketone ester, beta hydroxybutyrate, for prolonged mission-critical activities involving hard and deeply buried targets while in full mission oriented protective posture gear. The prototype transitioned to U.S. Special Operations Command. Magnetic Navigation: A prototype magnetic navigation system that leverages machine learning calibration algorithms to remove interference from an aircraft or missile's major subsystems in real time. The resulting 'clean' platform allows for GPS-denied navigation using magnetometers. After a successful demonstration, the prototype transitioned to the Air Force munitions directorate. 				
<p>Title: Strategic Multi-Layered Assessment (SMA) Reach Back Cell</p> <p>Description: The SMA Cell supports senior leadership in the Combatant Commands (CCMDs) and U.S. government agencies with actionable assessments of complex operational and technical challenges. The assessments help maintain our competitive advantage in an increasingly complex global environment. The SMA Reach Back cell was established by the Joint Staff Deputy Director for Global Operations at the request of the Commander, U.S. Central Command (USCENTCOM). SMA efforts leverage multi-agency, multi-disciplinary approaches to address requirements that are not within the customer organization's core competency. SMA assessments are framed during the year of execution and are in response to specific tasking from senior leadership in the CCMDs. The SMA Cell identifies options from across the U.S. government, academia, and the private sector. SMA efforts are facilitated by the Joint Chiefs of Staff/J-3 Operations and are executed by the Office of the Under Secretary of Defense, Research and Engineering. The SMA Reach Back Cell provides USCENTCOM with population-based and regional expertise in support of ongoing operations in the USCENTCOM area of responsibility.</p> <p>FY 2019 Plans: SMA will continue to work with USCENTCOM via the Reach Back Cell to support ongoing operations in Iraq, Syria, and Afghanistan by responding to queries from senior leaders. SMA was asked by the USCENTCOM Commander to pivot to South Asia to evaluate stability factors in Afghanistan; the influence of regional actors; and, prospects for reconciliation. SMA will continue to develop the reach back concept to provide a short-term tool to assist in understanding actor relationships and conducting if/then analyses.</p> <p>FY 2020 Plans:</p>		2.000	2.000	2.100

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
The SMA Cell will continue to actively work with the CCMDs and the Joint Staff to identify challenging problems that are not within the traditional areas of DoD expertise. These problems will be in direct support of CCMD senior leadership.				
FY 2019 to FY 2020 Increase/Decrease Statement: Level of effort is consistent between FY 2019 and FY 2020. Small changes reflect minor budget fluctuations.				
Title: Faster Short Tandem Repeat (FaSTR) Human Deoxyribonucleic Acid (DNA) Profiling System Description: FY 2018 funds completed development of a previously funded prototype rapid DNA analysis system. Current rapid DNA analysis systems rely on pneumatics and mechanical valves for microfluidic movement, resulting in bulky hardware and DNA analysis times greater than 60 minutes. The FaSTR DNA instrument re-purposes commercial-off-the-shelf electronics and exploits centrifugally-driven microfluidics to conduct sample preparation, polymerase chain reaction, and assessment of the results. This paradigm shift to microfluidic technology radically reduces the form factor, analysis time, and cost of the system. The FaSTR project will produce the first truly portable, rapid DNA analysis instrument capable of generating DNA profiles from "sample in" to "answer out" in less than 30 minutes, while providing a match probability of 1 in 55 billion people. In FY 2018, the project delivered three lightweight (<10 lbs.) prototypes, and 75 consumables for operational testing in theater. Test results, technical and training materials, and initial low rate production manufacturing technical specifications were delivered to the Army's Program Manager Office Biometrics and will support U.S. Central Command (USCENTCOM) and U.S. Special Operations Command (USSOCOM) missions.		0.200	-	-
Title: Biometrics and Forensics Science and Technology for Identity Dominance Description: Biometrics and Forensics Science and Technology projects develop and field prototypes to address emerging technology gaps that limit our ability to quickly and accurately identify anonymous individuals who threaten our physical and virtual assets. The overall goal of these projects is to reduce future operational risk to warfighters. New technologies demonstrated through this program will allow warfighters to identify threats, and counter our adversaries' attempts to mitigate our technologies. Biometrics and forensics projects will mature emerging technologies that support identity operations, forensic capabilities, and digital multi-media tools required by commanders and warfighters in ongoing and future military activities. These efforts encourage collaboration on biometrics and forensics projects within the DoD, and with interagency, industry, academia, and international partners. This model will help maximize collaborative investment and prevent redundant research. Deliverables are shared throughout the biometrics and forensics communities. FY 2019 Plans: The portfolio will continue to work on projects scheduled for delivery that include: the Enhanced Access Control for Husbanding Operations using Biometrics project, a web-based enrollment application to enable partnerships; and, Long Range Facial Identification Database, a repository of facial imagery collected at various standoff distances and operational conditions to		3.900	3.900	4.000

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
enable the rapid adoption of commercial-off-the-shelf technologies. Additional projects for biometrics and forensics portfolios will be selected after coordination throughout DoD and across other U.S. government departments and agencies to maximize collaborative investment and prevent unnecessary redundant research. FY 2020 Plans: RRF investment decisions for the biometric and forensic portfolio will emphasize on fostering new technologies that counter emerging threats. Projects will leverage new commercial technologies in the forensic landscape, institutional forensic laboratories, and other biometric and forensic stakeholders. New projects under consideration will be thoroughly coordinated across the biometric and forensic enterprises to minimize duplication, maximize cooperative funding, and identify the most promising projects with the strongest path for transitioning the technology. FY 2019 to FY 2020 Increase/Decrease Statement: Level of effort is consistent between FY 2019 and FY 2020. Small changes reflect minor budget fluctuations.				
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 innovation, exploring alternative and faster pathways for acquisition, and fielding affordable and effective capabilities. In FY 2018, Prototyping Through Non-Traditional Pathways conducted reviews focused on priorities of the multi-Service Science and Technology (S&T) Communities of Interest, the Office of the Under Secretary of Defense for Intelligence, and the Joint Improvised-Threat Defeat Organization. FY 2019 Plans: Prototyping Through Non-Traditional Pathways anticipates three to five reviews in FY 2019, and 15 to 20 resulting evaluations with potential for future prototypes. Each review focuses on identifying ideas in a specific topic area that can transition to meet joint operational needs through rapid prototyping. These reviews will be executed with DoD users and interagency partners such as Service program offices, U.S. Special Operations Command science and technology community, the DoD-wide S&T communities of interest, the Joint Improvised-Threat Defeat Organization, the Defense Health Agency, and the Department of Homeland Security. FY 2020 Plans:		3.000	3.000	3.100

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>Prototyping Through Non-Traditional Pathways anticipates three to five reviews in FY 2020, and 15 to 20 resulting tests and evaluations with potential for future prototypes. Topics areas will be informed by DoD users and interagency partners based on priorities identified in the execution year. These reviews will be executed with DoD users and interagency partners.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Level of effort is consistent between FY 2019 and FY 2020. Small changes reflect minor budget fluctuations.</p>			
<p>Title: Disparate Data Fusion, Analysis, and Applications for Networked Systems Focus Area</p> <p>Description: Disparate Data Fusion, Analysis, and Applications for Networked Systems prototypes validate new approaches to managing and capitalizing on the increase of data volume, variety, variability, and velocity from our networked communications and sensors. Growth in social media, big data analytics, and large dynamic sensor networks requires new tools for aggregation, processing, exploitation, and dissemination. Projects include the development of capabilities, software, and tools to fuse, analyze, and infer information from a wide variety of structured or unstructured datasets from a broad spectrum of sources. Where possible these projects will exploit advanced machine learning systems and commercial technologies to provide solutions to emerging challenges in tracking targets, big data analytics, and extracting indications and warnings. Technologies developed within this focus area will reduce cost and analyst requirements to provide meaningful intelligence in support of areas such as counter-missile/counter-weapons of mass destruction, gray-zone near-peer competition, human terrain mapping applications, and operations in denied areas.</p> <p>FY 2019 Plans: The Rapid Reaction Fund (RRF) investment decisions are made during the execution years in response to DoD, Combatant Command, Service, and other government priorities and as new threats emerge or new opportunities are presented. RRF will support development of prototypes and new disparate data fusion, analysis tools, and applications to provide a hedge against emerging, irregular, and asymmetric threats. The program anticipates supporting six to eight projects in FY 2019. Deliverables will leverage emerging technologies to exploit wide variety of information sources and reduce analyst requirements to provide actionable intelligence.</p> <p>FY 2020 Plans: The RRF investment decisions are made during the execution years in response to DoD, Combatant Command, Service, and other government priorities and as new threats emerge or new opportunities are presented. The program anticipates supporting six to eight projects in FY 2020. Deliverables will leverage emerging technologies to exploit disparate data and reduce analyst requirements to provide actionable intelligence.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement:</p>		-	5.985
			7.190

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
The FY 2018 and FY 2019 funding levels are lower than the baseline for this focus area, which is listed under FY 2020. This is because once projects are selected and funded during the years of execution (FY 2018/2019), the funds for these projects are reported elsewhere in this R-2. Projects have not been selected for FY 2020.			
Title: Autonomous Learning Systems and Behaviors Focus Area Description: Autonomous Learning Systems and Behaviors prototypes demonstrate capabilities to enhance the lethality of the joint force, reduce the time to make critical decisions, and protect warfighters through increased use of autonomous and human-machine collaborative systems. Autonomous Learning Systems and Behaviors projects leverage advances in machine learning to transfer cognitive burden closer to the point of collection/action. Example projects include agile computer vision systems, enhanced capabilities for multiple autonomous systems to cooperatively interact, autonomous task discrimination and prioritization, autonomous operation in complex terrain, data preprocessing to improve ex-filtration from unmanned sensors, human-machine collaborative decision making, and experiments to counter emerging unmanned threats from potential adversaries. These projects will also examine common software platforms and modular open architecture systems to reduce development cost, increase collaboration among manned and unmanned vehicles, increase agility through rapid customization, and inform requirements. FY 2019 Plans: Rapid Reaction Fund (RRF) investment decisions for Autonomous Learning Systems and Behaviors are made during the execution years in response to DoD, Combatant Command (CCMD), Service, and other government priorities. Selected projects will support development of components, payloads, and autonomous aerial, surface, and subsurface systems. RRF anticipates supporting six to seven projects in FY 2019. FY 2020 Plans: RRF investment decisions for Autonomous Learning Systems and Behaviors are made during the execution years in response to DoD, CCMD, Service, and other government priorities. RRF anticipates supporting six to seven projects in FY 2020. FY 2019 to FY 2020 Increase/Decrease Statement: The FY 2018 and FY 2019 funding levels are lower than the baseline for this focus area, which is listed under FY 2020. This is because once projects are selected and funded during the years of execution (FY 2018/2019), the funds for these projects are reported elsewhere in this R-2. Projects have not been selected for FY 2020.		-	5.508
Title: Enhanced Lethality in the Contested Urban Environment Focus Areas Description: Future military operations will likely occur in a broad range of urban environments with complex radio frequency, topological, situational awareness, and mobility challenges. Enhanced Lethality in the Contested Urban Environment Focus Area prototypes will identify, analyze, and describe typical urban areas for modeling, simulation, and planning purposes. These efforts		-	3.720
			4.995

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
will inform and enable development of intelligence, surveillance, and reconnaissance; electronic warfare; kinetic and non-kinetic effects; and, other capabilities needed for future military operations in a wide range of urban areas.			
FY 2019 Plans: The Rapid Reaction Fund (RRF) investment decisions for Enhanced Lethality in the Contested Urban Environment projects are made during the execution years in response to DoD, Combatant Command (CCMD), Service, and other government priorities. As new threats emerge and new opportunities are presented, RRF will select projects to demonstrate capabilities for Urban Characterization. RRF anticipates supporting four to five projects in FY 2019. Deliverables will include conceptual prototypes, modeling, and simulations to support planning efforts.			
FY 2020 Plans: The RRF investment decisions for Enhanced Lethality in the Contested Urban Environment projects are made during the execution years in response to DoD, CCMD, Service, and other government priorities. RRF anticipates supporting four to five projects in FY 2020.			
FY 2019 to FY 2020 Increase/Decrease Statement: The FY 2018 and FY 2019 funding levels are lower than the baseline for this focus area, which is listed under FY 2020. This is because once projects are selected and funded during the years of execution (FY 2018/2019), the funds for these projects are reported elsewhere in this R-2. Projects have not been selected for FY 2020.			
Title: Rapid Prototyping for Systems and Applications of Interconnected Sensors and Command Networks Focus Area		-	5.320
Description: Intelligence, surveillance, and reconnaissance (ISR) sensor networks are critical for providing asymmetric compensation against larger, near-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. Efforts in this focus area will increase the speed of innovation and technology adoption for dynamic, inhomogeneous, fully networked sensors and develop new tools to more effectively analyze or visualize ISR data. Projects include improved sensor hardware; new capabilities enabled by networking sensor systems; sensor network protection and assured communications; validation of low-cost, robust persistent surveillance capabilities; and, establishment of more effective processing, exploitation, and dissemination capabilities. Rapid Reaction Fund (RRF) sponsored prototypes will facilitate integration of advanced ISR and communication capabilities into new and existing systems. These prototypes will help increase the effectiveness of ISR architectures and reduce the human analyst requirement to produce actionable intelligence.			6.671
FY 2019 Plans: RRF investment decisions for sensor network prototypes are made during the execution years in response to Department, Combatant Command (CCMD), Service, and other government priorities and as new threats emerge or new opportunities are			

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
presented. Research and coordination with organizations throughout DoD and other government agencies will help identify areas critical to developing future capabilities. RRF anticipates supporting five to seven projects in FY 2019. Deliverables will include prototype systems, analytical capabilities, and software for a variety of platforms.			
FY 2020 Plans: RRF investment decisions for sensor network prototypes are made during the execution years in response to Department, CCMD, Service, and other government priorities. RRF anticipates supporting five to seven projects in FY 2020.			
FY 2019 to FY 2020 Increase/Decrease Statement: The FY 2018 and FY 2019 funding levels are lower than the baseline for this focus area, which is listed under FY 2020. This is because once projects are selected and funded during the years of execution (FY 2018/2019), the funds for these projects are reported elsewhere in this R-2. Projects have not been selected for FY 2020.			
Title: Novel Manufacturing Focus Area		-	5.325
Description: This focus area will develop the enabling capabilities and key prototypes required to advance and secure new manufacturing technologies including additive manufacturing, emerging microelectromechanical systems (MEMS), and tailored integrated circuit architectures to meet specific warfighter needs. New manufacturing technologies are enabling revolutionary advances in existing capabilities such as hand held deoxyribonucleic acid (DNA) sequencing; advanced wearable devices; tailored metamaterials; advanced MEMS radio frequency circuits; and integrated photonic devices. Many novel manufacturing processes allow for rapid prototyping and iterative innovation, removing barriers for technology insertion. These manufacturing technologies provide a unique capability for maintaining a U.S. competitive advantage through order of magnitude size, weight, and power reductions; increased speed from design to prototype; reduced cost; and reduced waste. This focus area will leverage swiftly-developing commercial innovation and emerging capabilities of the Federally Funded Research and Development Centers, government laboratories, and academia to develop conceptual prototypes focused on warfighter needs. Projects will also investigate security of additive manufacturing technologies, digital schematics, MEMS devices, and custom integrated circuit architectures. Deliverables will also inform enhancement decisions and concept of operations development.			6.486
FY 2019 Plans: Rapid Reaction Fund (RRF) investment decisions are made during the execution years in response to Department, Combatant Commands (CCMD), Service, and other government priorities and as new threats emerge or new opportunities are presented. For novel manufacturing projects this agility supports leveraging new capabilities developed by commercial industry. Research and coordination with organizations throughout DoD and other government agencies will help identify needs that could be addressed by future capabilities within the additive manufacturing field. RRF anticipates supporting five to seven projects in FY 2019.			
FY 2020 Plans:			

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
RRF investment decisions are made during the execution years. The selection of future novel manufacturing projects will be based on priorities throughout DoD and other government agencies, and new opportunities for additive manufacturing. RRF anticipates supporting five to seven projects in FY 2020.				
FY 2019 to FY 2020 Increase/Decrease Statement: The FY 2018 and FY 2019 funding levels are lower than the baseline for this focus area, which is listed under FY 2020. This is because once projects are selected and funded during the years of execution (FY 2018/2019), the funds for these projects are reported elsewhere in this R-2. Projects have not been selected for FY 2020.				
Title: Prototyping Through Novel Reuse of Government/Commercial-Off-the-Shelf (G/COTS) Technologies Focus Area Description: This effort increases impact and responsiveness of prototyping efforts through the reuse and repurposing of existing commercial and governmental technologies. Frequently, systems developed for a separate application provide a partial solution to new emerging challenges. By building new prototypes around a core of proven technologies, this effort reduces development and adoption risk in addition to controlling cost. This focus area provides RRF with agility by leveraging existing technologies to develop new prototypes and demonstrate new capabilities more quickly.		-	2.240	3.533
FY 2019 Plans: The Rapid Reaction Fund (RRF) investment decisions for G/COTS-based prototypes are made during the execution years in response to Department, CCMD, Service, and other government organization priorities and as new threats emerge or new opportunities are presented. Projects identified include efforts to repurpose commercial communication protocols into an electronic warfare capability, advances in microelectronic circuits, airport radar systems for bird alerts repurposed for counter-unmanned aircraft system (UAS), advances in quantum sensors and programming for quantum processors, and commercial network security platforms. RRF anticipates supporting three to four projects in FY 2019.				
FY 2020 Plans: The RRF investment decisions for G/COTS-based prototypes are made during the execution years in response to Department, CCMD, Service, and other government organization priorities. RRF anticipates supporting three to four projects in FY 2020.				
FY 2019 to FY 2020 Increase/Decrease Statement: The FY 2018 and FY 2019 funding levels are lower than the baseline for this focus area, which is listed under FY 2020. This is because once projects are selected and funded during the years of execution (FY 2018/2019), the funds for these projects are reported elsewhere in this R-2. Projects have not been selected for FY 2020.				
Accomplishments/Planned Programs Subtotals		39.082	36.998	44.796

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		FY 2018	FY 2019
Congressional Add: Solar Energy Research		3.000	-
FY 2018 Accomplishments: The Solar Energy Research project is an FY 2018 Congressional program increase to produce risk-reducing prototypes that rapidly mature innovative concepts and immature technologies into tangible capabilities for the warfighter. Selected projects matured advanced solar cell chemistries; innovative form factors; and, new manufacturing processes. In 2018, this project initiated development efforts including stakeholder coordination, system design, and test planning. Using FY 2018 funds, this project will mature a hardware prototype and demonstrate the advance solar cells on a military relevant system in 2019. This project will be executed in accordance with Congressional intent.			
Congressional Adds Subtotals		3.000	-
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.			
E. Performance Metrics			
The Rapid Reaction Fund (RRF) supports the FY 2020 performance metrics to transition projects that address Joint Force and Combatant Command capability gaps. In FY 2018, RRF transitioned 33 prototypes with an overall transition rate of 80 percent. All RRF projects are monitored for schedule deviation, transition outcome, and deliverables such as advanced algorithms, hardware, and other components.			

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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
831: Joint Rapid Acquisition Cell Support	9.561	1.649	1.669	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
Note												
In FY 2020 JRAC will be transferred to an Operations and Maintenance Program Element (0903399D8Z) within the Office of the Under Secretary of Defense for Acquisition and Sustainment for proper alignment and execution.												
A. Mission Description and Budget Item Justification												
This funding includes support for the Joint Rapid Acquisition Cell (JRAC) to enable management and tracking of Combatant Command (CCMD) identified and Joint Staff validated immediate warfighter needs. The JRAC is responsible to:												
(1) Coordinate review of validated Joint Urgent Operational Needs (JUON) and Joint Emergent Operational Needs (JEON) and assign responsibility to appropriate DoD Components for timely funding and resolution.												
(2) Serve as the review and approval authority for the DoD Components' strategy to fund and mitigate the identified JUON/JEON capability gaps.												
(3) Continually assess actions taken by the DoD Components to resolve JUONs/JEONs and recommend to the Under Secretary of Defense for any changes determined appropriate to improve their responsiveness to JUONs/JEONs.												
(4) Provide periodic reports to the Secretary of Defense on new and outstanding JUONs/JEONs.												
(5) In coordination with Under Secretary of Defense Comptroller (USD(C)), manage the Rapid Acquisition Fund (RAF) to allocate resources to priority unfunded JUONs/JEONs.												
(6) In coordination with the Office of the Chairman of the Joint Chiefs of Staff and the USD(C), make programmatic, budget, and acquisition recommendations for JUONs and identify capability gaps to the Secretary of Defense.												
B. Accomplishments/Planned Programs (\$ in Millions)									FY 2018	FY 2019	FY 2020	
Title: Joint Rapid Acquisition Cell (JRAC) Management Support									1.649	1.669	0.000	
Description: This funding is used to support the staff manning of the JRAC to enable management and tracking of CCMD identified and Joint Staff validated immediate warfighter needs.												
FY 2019 Plans:												
Continue support for the JRAC management and tracking of CCMD initiatives. Continue validation of the warfighter needs by the Joint Staff.												
FY 2020 Plans:												
Using FY 2019 funding, JRAC will continue support for management and tracking of CCMD initiatives.												
FY 2019 to FY 2020 Increase/Decrease Statement:												

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603826D8Z / <i>Quick Reaction Special Projects (QRSP)</i>	Project (Number/Name) 831 / <i>Joint Rapid Acquisition Cell Support</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
As part for the FY 2020 realignment, Joint Raid Acquisition Cell support will be transferred to Program Element 0903399D8Z within the Office of the Under Secretary of Defense for Acquisition and Sustainment for alignment and execution.			
Accomplishments/Planned Programs Subtotals		1.649	0.000
C. Other Program Funding Summary (\$ in Millions) N/A			
Remarks			
D. Acquisition Strategy N/A – Capabilities acquired to fulfill Joint Urgent Operational Needs (JUON) and Joint Emergent Operational Needs (JEON) are provided by other DoD components.			
E. Performance Metrics Joint Rapid Acquisition Cell performance metrics are specific to each JUON/JEON and include measures identified in the management approach for each action. In addition, JUON/JEON completions and successes are monitored against schedules and deliverables stated in the management approach. The metrics that JRAC support correlates to is the number of full time personnel identified in the JRAC support contract with associated pay rates and shall not exceed the specified amounts or hourly rates and/or firm fixed price.			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
833: Strategic Multi-Layered Assessment (SMA) Support	10.704	2.301	2.324	2.351	-	2.351	2.375	2.399	2.423	2.447	Continuing	Continuing

A. Mission Description and Budget Item Justification

The Strategic Multi-Layered Assessment (SMA) branch supports all Combatant Commands (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, SMA develops options to CCMD-generated challenging problems and informs the command's senior leadership. Each SMA effort is initiated at the request of senior CCMD leadership. Priorities for SMA problems are set by the Joint Staff Deputy Director for Global Operations (DDGO). Products are typically produced within six to nine months and directly contribute to the decision making process of CCMD's senior leaders. SMA is also supported by the Rapid Reaction Fund (RRF).

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
<div><div>Title: Strategic Multi-Layered Assessment (SMA)</div><div>Description: The SMA Cell supports the Combatant Commands (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 United States Security Coordinator for Israel and the Palestinian Authority. The effort evaluated strategic risks and identified knowledge gaps to provide an increased understanding of potential security environments and their implications for Palestinian security sector reform. U.S. European Command (USEUCOM) subsequently asked SMA to apply the same methodology to identify emerging Russian threats and opportunities in Eurasia. SMA efforts are facilitated by the Joint Chiefs of Staff/J-3 Operations and are executed by the Office of the Under Secretary of Defense, Research and Engineering.</div><div>FY 2019 Plans: In support of U.S. Indo-Pacific Command and U.S. Army Pacific, SMA’s follow on Gray Zone effort, Strategic Outcomes in the Korea Peninsula, will continue to analyze near-term and long-term strategic outcomes resulting from alternative U.S. political-military options for addressing the nuclear and ballistic missile programs of the Democratic People’s Republic of Korea. SMA will continue to actively work with the CCMDs and the Joint Chiefs of Staff to identify challenging problems that are not within the traditional areas of DoD expertise.</div><div>FY 2020 Plans: SMA will actively work with the CCMDs and the Joint Chiefs of 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 and may include areas</div></div>	1.240	2.324	2.351

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603826D8Z / <i>Quick Reaction Special Projects (QRSP)</i>	Project (Number/Name) 833 / <i>Strategic Multi-Layered Assessment (SMA) Support</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
such as: counter terrorism, transnational criminal organizations, counter weapons of mass destruction (state and non-state), counter global or regional social and cultural assessments, regional stability assessments, and individual state or national level deterrence studies.			
FY 2019 to FY 2020 Increase/Decrease Statement: Level of effort is consistent between FY 2019 and FY 2020. Small changes reflect minor budget fluctuations and growth consistent with inflation.			
Title: Gray Zone Conflicts: Contested Space Operations Continued for Air Force Space Command (AFSPC) and Strategic Outcomes in the Korean Peninsula Description: Building on prior SMA efforts, U.S. Special Operations Command requested that SMA assess how the U.S. government can diagnose, identify, and assess indirect strategies, and develop response options against associated types of Gray Zone challenges. SMA completed several actor and social media analyses including Virtual Think Tank Assessments (ViTTa) that provided summarized subject matter expert (SME) analyses to USSOCOM. At the request of AFSPC, the FY 2017 and FY 2018 Gray Zone efforts focused on contested space operations. Among other issues, this effort addressed the implications (rewards and risks) of the U.S. adopting a policy of space as a joint, combined, and inter-agency warfighting domain. At the request of U.S. Indo-Pacific Command (USINDOPACOM) and U.S. Army Pacific (USARPAC), FY 2018 funding also initiated an assessment of plausible political-military options regarding North Korea and near- and long-term implications of these for the U.S. and regional stakeholders. These two follow-on Gray Zone efforts will apply the concepts and insights derived during the first phase to the realm of contested space operations in support of AFSPC, and implications of various U.S. actions towards North Korea. Analysis will highlight the indications and warnings and the U.S. response options.		1.061	-
Accomplishments/Planned Programs Subtotals		2.301	2.324
C. Other Program Funding Summary (\$ in Millions) N/A			
Remarks			
D. Acquisition Strategy N/A			
E. Performance Metrics SMA performance metrics are specific to each effort and include measures identified in the specific project plans. In addition, project completions and successes are monitored against schedules and deliverables stated in the execution documents. Each project's results are reviewed by a senior review group that is comprised with representatives from the Office of the Secretary of Defense, the Joint Chiefs of Staff, the Combatant Commands, and outside subject matter experts. The ultimate			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603826D8Z / <i>Quick Reaction Special Projects (QRSP)</i>	Project (Number/Name) 833 / <i>Strategic Multi-Layered Assessment (SMA) Support</i>

measure of success is adoption and transition of SMA products by the CCMD and supporting entities. In FY 2018, SMA products were delivered to senior leadership and staff at U.S. Special Operations Command, U.S. Central Command, and U.S. European Command.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 3: Advanced Technology Development (ATD)</i>					R-1 Program Element (Number/Name) PE 0603833D8Z I <i>Engineering Science and Technology (S&T)</i>							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	40.102	24.447	19.371	19.376	-	19.376	19.511	19.722	19.912	15.230	Continuing	Continuing
401: <i>DoD Modeling and Simulation Management Office</i>	6.454	12.111	4.609	4.701	-	4.701	4.795	4.855	4.975	4.980	Continuing	Continuing
402: <i>Systems Engineering Research Center</i>	9.400	3.911	4.904	4.900	-	4.900	4.924	4.930	4.937	5.250	Continuing	Continuing
403: <i>Engineered Resilient Systems</i>	24.248	8.425	9.858	9.775	-	9.775	9.792	9.937	10.000	5.000	Continuing	Continuing

A. Mission Description and Budget Item Justification

This Program Element (PE) addresses Defense Research and Engineering priorities to advance engineering state of the practice, and complex defense systems challenges through development of engineering capabilities to improve acquisition quality. Engineering science and technology, including modeling and simulation (M&S), systems engineering (SE) research, and engineering capabilities for resilience, supports the cost-effective acquisition of complex systems in support of the full range and scope of Department of Defense (DoD) missions and operations.

This Program Element (PE) addresses the National Defense Strategy priorities of increasing lethality, strengthening alliances and supporting Department business reform. Engineering Science and Technology underpins improving department-wide practices of evaluating and improving the lethality of complex systems through modeling and simulation and engineering capabilities for resilience. Improvements to the Department's systems engineering and simulation capabilities have a profound effect on ensuring that we are able to quickly and affordably field a lethal Joint Force by addressing the interwoven dependencies in system and mission capabilities, rapidly evolving technologies, lifecycle considerations, and resource limitations in the face of dynamic threats and changing missions. In addition, these engineering and modeling and simulation practices cross international boundaries and is an area of collaboration with our Allies; it improves the way we are able to train as an allied force and operate together on the battlefield.

M&S is a key enabler of DoD capabilities; underpins innovative solutions meeting real-world national security challenges and ensuring technical superiority; acts as a force multiplier; saves resources; and saves lives. The DoD Modeling and Simulation Management Office (MSMO), designated by the Office of the Under Secretary of Defense, Research and Engineering (OUSD(R&E)) to be the focal point and advocate for DoD M&S, enhances the DoD M&S Enterprise by (1) enabling joint and cross-cutting 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.

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. Greatly improved SE methods, processes and tools are essential to the DoD strategy to field systems that are agile, affordably sustainable, and ready to incorporate emerging technologies to address a full range of contingencies, in the face

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I</i> BA 3: <i>Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603833D8Z <i>I Engineering Science and Technology (S&T)</i>
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of constrained budgets and an aging workforce. The SERC consists of a network of 22 research universities from across the U.S. that work collaboratively to bring the best talent in the nation to bear on DoD's systems engineering research problems.

Engineered Resilient Systems (ERS) addresses the need for the faster design of cost- and mission-effective DoD warfighting systems by conducting research and development in computational engineering tools, system performance models, and data analysis techniques. From early design and testing through validation, fielding and sustainment, these tools and techniques give decision makers the information needed to make better-informed decisions and ensure Warfighter and mission success. A digital engineering initiative, ERS increases design agility by increasing design options across the lifecycle, leading to improvements in testing, manufacturing, fielding and sustainment of mission-effective and adaptable systems. ERS uses an advanced science and technology driven approach to provide the following core capabilities: Set-Based Design (SBD), Computational Engineering and Large-Scale Data Analytics. With ERS, DoD is reducing risk in future systems development by using high-fidelity modeling and advanced analyses of design options, as well as linking candidate platforms to traditional modeling and simulation toolkits and employing DoD's high-performance computing assets.

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	25.395	19.415	19.431	-	19.431
Current President's Budget	24.447	19.371	19.376	-	19.376
Total Adjustments	-0.948	-0.044	-0.055	-	-0.055
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.899	-			
• FFRDC Adjustments	-0.049	-0.044	-	-	-
• Other Program Adjustments	-	-	-0.055	-	-0.055

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 3					R-1 Program Element (Number/Name) PE 0603833D8Z / <i>Engineering Science and Technology (S&T)</i>				Project (Number/Name) 401 / <i>DoD Modeling and Simulation Management Office</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
401: <i>DoD Modeling and Simulation Management Office</i>	6.454	12.111	4.609	4.701	-	4.701	4.795	4.855	4.975	4.980	Continuing	Continuing

A. Mission Description and Budget Item Justification

Modeling and Simulation (M&S) supports the full range and scope of Department of Defense (DoD) missions and operations, including joint and cross-cutting. M&S is a key enabler of DoD capabilities; underpins innovative solutions meeting defense and national security challenges to ensure technical superiority, and saves resources. The Office of the Under Secretary of Defense for Research and Engineering (OUSD(R&E)), under the authority of DoD Directive 5134.01, designated the DoD Modeling and Simulation Management Office (MSMO) to be the focal point and advocate for Defense M&S to enhance the Defense 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 executes its efforts in accordance with the OUSD(R&E)-promulgated DoD Directive 5000.59, "Management of Modeling and Simulation" and DoD Instruction 5000.70, "Management of DoD Modeling and Simulation (M&S) Activities;" and other DoD Issuances, including DoD 4120.24-M, "DoD Standardization Program (DSP) Policies and Procedures" and DoD Manual 3200.14 Volumes 1 and 2, "Principles and Operational Parameters of the DoD Scientific and Technical Information Program (STIP)."

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 2018	FY 2019	FY 2020
Title: DoD Modeling and Simulation Management Office (MSMO)	12.111	4.609	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.			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense			Date: February 2019		
Appropriation/Budget Activity 0400 / 3		R-1 Program Element (Number/Name) PE 0603833D8Z / <i>Engineering Science and Technology (S&T)</i>		Project (Number/Name) 401 / <i>DoD Modeling and Simulation Management Office</i>	
B. Accomplishments/Planned Programs (\$ in Millions)			FY 2018	FY 2019	FY 2020
<p>MSMO: (1) conducts management and technical support for the Department's current and long-term M&S needs; (2) responds to opportunities to leverage relevant DoD Information Technology (IT) enterprise capabilities and DoD-, Industry-, and Academia-developed M&S technologies; and (3) advocates an enterprise approach for the future of DoD M&S, maintaining strong engagement and ties with Defense and external community stakeholders.</p> <p>FY 2019 Plans: FY 2019 Plans: Integrated Defense Analytic Capability:</p> <ul style="list-style-type: none"> • Demonstrate limited prototype, develop and standardize a capability for incorporating Intelligence into analysis for acquisition decision issues using Blue and Red models in an appropriate simulation environment in a joint concept. • Expand Community of Practice focusing on high-fidelity, joint mission simulation capabilities to enable acquisition professionals and warfighters to leverage these capabilities and enable reuse of databases, tools, and documentation. <p>Policy and Guidance:</p> <ul style="list-style-type: none"> • Publish a DoD M&S Guidebook to guide the Department's planning for and investing in M&S capabilities and tools. • Reissue overarching DoD policy- Convert DoD Directive 5000.59 to DoD Instruction 5000.59. • Assist Services and Defense Agencies in development of their Verification, Validation, and Accreditation (VV&A) plans. <p>Standards:</p> <ul style="list-style-type: none"> • Serve as the Lead Standardization Activity for M&S Standards and Methodologies, and/or lead and participate in Defense Standardization Program Office and Joint Enterprise Standards Committee activities and International standards activities such as NATO Standardization Agreements for M&S. • Enhance the Defense M&S Reference Architecture with additional patterns identified through user feedback. <p>Technology:</p> <ul style="list-style-type: none"> • Develop, enhance, and advocate the M&S enterprise suite of tools to improve joint and cross-cutting M&S capabilities. • Chair M&S Community of Interest, Cyber M&S Technical Working Group, and M&S Architecture Working Group. • Perform technology watch/horizon scanning related to M&S emerging capabilities to provide investment shaping and strategic direction. • Guide and support the Defense Science Board Task Force on Gaming, Exercises, and Modeling & Simulation (GEMS)through outreach, information and knowledge. <p>Collaboration:</p>					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense			Date: February 2019		
Appropriation/Budget Activity 0400 / 3		R-1 Program Element (Number/Name) PE 0603833D8Z / <i>Engineering Science and Technology (S&T)</i>		Project (Number/Name) 401 / <i>DoD Modeling and Simulation Management Office</i>	
B. Accomplishments/Planned Programs (\$ in Millions)			FY 2018	FY 2019	FY 2020
<ul style="list-style-type: none"> • Work with Defense stakeholders, continue and refine Department-wide M&S gaps monitoring and reduction capability. • Continue to leverage investment in M&S Catalog tools to expand reuse and interoperability among Defense M&S communities. • Work with USSOCOM and Simulator Interoperability Senior Steering Group to assess USSOCOM, other Combatant Commands, and Service needs for Simulator Interoperability. <ul style="list-style-type: none"> • Represent U.S. interests in International M&S activities: <ul style="list-style-type: none"> - Collaborate with the NATO M&S Group (NMSG) and participate in NMSG task groups. - US/UK Stocktake Future Operational Environment - Coordinate The Technical Cooperation Program (TTCP) Virtual Interoperability Prototyping and Research Environment (VIPRE) development with 5-Eyes partners • Collaborate with interagency organizations, as required. <p>FY 2020 Plans:</p> <p>Policy and Guidance:</p> <ul style="list-style-type: none"> • Publish a DoD M&S Strategy to guide the Department's planning for and investing in M&S capabilities and tools. • Assist Services and Defense Agencies in development of their Verification, Validation, and Accreditation (VV&A) plans. <p>Standards:</p> <ul style="list-style-type: none"> • Serve as the Lead Standardization Activity for M&S Standards and Methodologies, and/or lead and participate in Defense Standardization Program Office and Joint Enterprise Standards Committee activities and International standards activities such as NATO Standardization Agreements for M&S. • Enhance the Defense M&S Reference Architecture with additional patterns identified through user feedback. <p>Technology:</p> <ul style="list-style-type: none"> • Develop, enhance, and advocate the M&S enterprise suite of tools to improve joint and cross-cutting M&S capabilities. • Chair M&S Community of Interest, Cyber M&S Technical Working Group, and M&S Architecture Working Group. • Perform technology watch/horizon scanning related to M&S emerging capabilities to provide investment shaping and strategic direction. <p>Collaboration:</p> <ul style="list-style-type: none"> • Work with Defense stakeholders, continue and refine Department-wide M&S gaps monitoring and reduction capability, • Work with USSOCOM and Simulator Interoperability Senior Steering Group to assess USSOCOM, other Combatant Commands, and Service needs for Simulator Interoperability. • Represent U.S. interests in International M&S activities: 					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603833D8Z / <i>Engineering Science and Technology (S&T)</i>	Project (Number/Name) 401 / <i>DoD Modeling and Simulation Management Office</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<ul style="list-style-type: none"> - Collaborate with the NATO M&S Group (NMSG) and participate in NMSG task groups. - US/UK Stocktake Future Operational Environment - Continued TTCP VIPRE coordination • Collaborate with interagency organizations, as required. 			
FY 2019 to FY 2020 Increase/Decrease Statement: Level of effort is consistent between FY 2019 and FY 2020. Small changes reflect minor budget fluctuations.			
Accomplishments/Planned Programs Subtotals		12.111	4.609
C. Other Program Funding Summary (\$ in Millions) N/A			
Remarks N/A			
D. Acquisition Strategy N/A			
E. Performance Metrics Performance in this program is monitored in the following ways: <ul style="list-style-type: none"> - Number of instances where M&S standards, technical best practices, or tools have been adopted or employed. - Number of M&S resources (tools, data, and services) made visible or updated in the DoD M&S Enterprise Catalog for reuse and the completeness of each record according to DoD discovery metadata standards. 			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
402: Systems Engineering Research Center	9.400	3.911	4.904	4.900	-	4.900	4.924	4.930	4.937	5.250	Continuing	Continuing

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. Greatly improved SE methods, processes and tools are essential to the DoD strategy to field systems that are agile, affordably sustainable, and ready to incorporate emerging technologies to address a full range of contingencies, in the face of constrained budgets and an aging workforce.

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 2018	FY 2019	FY 2020
Title: Systems Engineering Research Center	3.911	4.904	4.900
Description: The SERC is a DoD UARC which conducts University-based research that directly supports DoD's National Defense Strategy through development of new systems engineering methods, processes and tools.			
FY 2019 Plans: Continue to enhance engineering methods, processes and tools (MPTs) to improve in the following areas:			
<ul style="list-style-type: none"> • Systems Engineering Transformation: transform current systems engineering methods to enable rapid, concurrent and scalable definition and affordable development of flexible systems that are responsive to changing threats and missions; <ul style="list-style-type: none"> – Develop and apply formal methods for resilient systems design to control unmanned aerial vehicle operations. • Enterprises and Systems of Systems: create foundational methods to develop and design enterprises and system of systems to provide an overwhelming competitive advantage over our adversaries; <ul style="list-style-type: none"> – Develop and apply models to gauge expected results from composition of diverse, modular components and systems. 			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense			Date: February 2019		
Appropriation/Budget Activity 0400 / 3		R-1 Program Element (Number/Name) PE 0603833D8Z / <i>Engineering Science and Technology (S&T)</i>		Project (Number/Name) 402 / <i>Systems Engineering Research Center</i>	
B. Accomplishments/Planned Programs (\$ in Millions)			FY 2018	FY 2019	FY 2020
<ul style="list-style-type: none"> • Trusted Systems: secure defense systems from cyber and other threats through systemic security and assurance approaches that complement incomplete current perimeter/network defense methods; <ul style="list-style-type: none"> – Development and trial applications of model-based system assurance methods. • Human Capital Development: speed the professional development of highly capable systems engineers and technical leaders in the Department and the Defense Industrial Base. <ul style="list-style-type: none"> – Develop technical report identifying methods for organizations to improve their engineering workforce along with the expected benefits. <p>Together, these new methods will accelerate the delivery of critical mission capabilities and technologies, such as autonomy and machine learning, in the face of a dynamic cyber adversary.</p> <p>FY 2020 Plans: Continue to enhance engineering methods, processes and tools (MPTs) to improve in the following areas:</p> <ul style="list-style-type: none"> • Systems Engineering Transformation: transform current systems engineering methods to enable rapid, concurrent and scalable definition and affordable development of flexible systems that are responsive to changing threats and missions; <ul style="list-style-type: none"> - Develop and apply tradespace analysis methods to balance dynamic requirements and emerging technologies to improve mission success. • Enterprises and Systems of Systems: create foundational methods to develop and design enterprises and system of systems to provide an overwhelming competitive advantage over our adversaries; <ul style="list-style-type: none"> – Develop and apply enterprise model to measure factors impacting use digital engineering methods to acquire DoD's weapon systems, and the resulting mission benefits. • Trusted Systems: secure defense systems from cyber and other threats through systemic security and assurance approaches that complement incomplete current perimeter/network defense methods; <ul style="list-style-type: none"> – Develop risk-based algorithms and tools for static analysis of software, integrating attack databases and well-known vulnerabilities to prioritize mitigation activities. • Human Capital Development: speed the professional development of highly capable systems engineers and technical leaders in the Department and the Defense Industrial Base. 					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603833D8Z / <i>Engineering Science and Technology (S&T)</i>	Project (Number/Name) 402 / <i>Systems Engineering Research Center</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>– Develop systems engineering competencies in undergraduate engineers through capstone design projects that provide novel solutions to warfighter problems.</p> <p>Together, these new methods will accelerate the delivery of critical mission capabilities and technologies, such as autonomy and machine learning, in the face of a dynamic cyber adversary.</p> <p><i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> Level of effort is consistent between FY 2019 and FY 2020. Small changes reflect minor budget fluctuations.</p>			
Accomplishments/Planned Programs Subtotals		3.911	4.904
C. Other Program Funding Summary (\$ in Millions)			
N/A			
Remarks			
D. Acquisition Strategy			
N/A			
E. Performance Metrics			
<p>Develop and extend fundamental knowledge, advanced methods, processes and tools and cutting edge techniques for systems engineering of complex designs of relevance to the DoD mission.</p> <p>- Promulgation of advanced system engineering approaches through research publications, presentations and workshops.</p> <p>- Adoption of SERC methods, processes, and tools into DoD component activities.</p>			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 3					R-1 Program Element (Number/Name) PE 0603833D8Z / <i>Engineering Science and Technology (S&T)</i>				Project (Number/Name) 403 / <i>Engineered Resilient Systems</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
403: <i>Engineered Resilient Systems</i>	24.248	8.425	9.858	9.775	-	9.775	9.792	9.937	10.000	5.000	Continuing	Continuing

A. Mission Description and Budget Item Justification

Engineered Resilient Systems (ERS) improves design agility and cost-effectiveness during analysis and development leading to improvements in testing, manufacturing, fielding and sustainment of mission-effective and adaptable systems. Its products are engineering design visualization and tool integration frameworks which integrate physics-based models and engineering tools to vastly improve the ability to perform tradespace and requirements analysis, optimize designs and improve architectures. These improved architectures will enable systems to more rapidly adapt to changing technologies and threats. ERS uses advanced science and technology methods to provide the following core capabilities: Set-Based Design (SBD), Computational Engineering and Large-Scale Data Analytics. These engineering improvements will accelerate delivery of advanced capabilities to the warfighter and address a geopolitical environment marked by rapidly changing threats, tactics, missions and technologies, and fiscal constraints. The pace of change renders current point-design approaches unsustainable in both cost and time. ERS methods and tools help engineers integrate advanced technologies into systems affordably, at the speed of relevance.

ERS research and development aims to transition practical applications to programs within the DoD, while continuing to evolve and develop future capabilities. ERS focuses on new concepts for implementing an integrated suite of modern computational engineering tools, models, simulations and related capabilities, and tradespace assessment and visualization tools with an architecture aligned with acquisition and operational business processes. These integrated tools will operate within a framework that supports transparency, inclusion and data-driven decision-making in an innovative environment that provides advanced knowledge management, including data retention and lessons-learned, and enables multi-community collaboration. 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, web-based analysis with large data sets, and lifecycle cost sensitivity analysis). These new computational and model-based frameworks adapt advanced design and modeling approaches from Government, industry, and academia to enable our Nation to affordably deliver warfighting capability at the speed of relevance. ERS provides the capability to fully explore and identify key performance parameters and inform the requirements process. With ERS, DoD is reducing risk of future systems development by using high-fidelity modeling and advanced analyses of design options, as well as linking candidate platforms to traditional modeling and simulation toolkits and employing DoD's high-performance computing assets. ERS leverages existing investments in surface and subsurface ships, aircraft, and ground vehicles, radio frequency, meshing and geometry models. Future domains, driven by Service requirements, may include future developments in Space, Hypersonics, Electronic Warfare and Directed Energy.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
Title: Engineered Resilient Systems (ERS)	8.425	9.858	9.775
Description: Description: Engineered Resilient Systems (ERS) addresses the need for achieving more affordable, technically superior and mission-resilient warfighting systems designed within a shorter time frame by conducting research and development to deliver new concepts and capabilities to implement an integrated suite of modern computational engineering tools, modeling capabilities, and tradespace assessment and visualization tools within an architecture aligned with acquisition and operational			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense			Date: February 2019		
Appropriation/Budget Activity 0400 / 3		R-1 Program Element (Number/Name) PE 0603833D8Z / <i>Engineering Science and Technology (S&T)</i>		Project (Number/Name) 403 / <i>Engineered Resilient Systems</i>	
B. Accomplishments/Planned Programs (\$ in Millions)			FY 2018	FY 2019	FY 2020
<p>business processes. These integrated tools will operate within a framework that supports transparency, inclusion and data-driven decision-making in an innovative environment that enables advanced knowledge management and multi-community collaboration, including data retention and lessons learned. The work being done through the ERS program currently spans all services and aids in analyses of fixed-wing aircraft, rotorcraft, ground vehicles, ships and missiles. The services use ERS for computational analysis to validate new technology solutions prior to making major investment decisions.</p> <p>FY 2019 Plans: Set-Based Design: Improve and test primary framework for ERS next-generation tradespace analysis tools with data storage, statistical analysis, and advanced visualization techniques; develop model integration technologies to retain tradespaces and other early conceptual design artifacts; and develop linkage between system requirements and tradespace analysis, (e.g., multi-domain analysis of Air Force fixed-wing and missile design alternatives).</p> <p>Computational Engineering: Develop design process automation to rapidly incorporate new and existing high-fidelity models into the analysis of existing and proposed weapon systems; develop and demonstrate advanced parametric design and optimization tools to create credible acquisition models; develop computational environments that facilitate the use of high-performance computing infrastructure within the engineering design and analysis processes, (e.g., increasing the number of propeller designs evaluated for subsurface propulsion).</p> <p>Large-Scale Data Analytics: Leverage physical test datasets and national investments in artificial intelligence, machine learning, and deep learning technologies in order to produce concept prognostic and diagnostic tools for lifecycle analyses; begin exploration of the deployment of algorithms and tools trained with artificial intelligence and machine learning techniques to DoD platforms, (e.g., large scale data analysis of rotorcraft prognostics and health management data to inform sustainment decisions).</p> <p>FY 2020 Plans: FY 2020 Plans: Set-Based Design: Develop decision-support environments to enable set-based design, optimization, tradespace analysis, and visualization of data from DoD platforms; and incorporate techniques to reduce data duplication and increase reuse of data, models, software tools, and analysis, (e.g., develop methods and tools for multi-domain analysis of DoD technology priorities, such as hypersonics and directed energy).</p> <p>Computational Engineering: Develop and evolve computational tools to support parametric design environments; utilize high-performance computing to enable new capabilities in novel areas; continue to facilitate the rapid development of environmental scenarios to assess the impact of a variety of physical conditions on DoD materiel in operationally relevant environments;</p>					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603833D8Z / <i>Engineering Science and Technology (S&T)</i>	Project (Number/Name) 403 / <i>Engineered Resilient Systems</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
and integrate multiple disciplines into ERS workflows such as high-fidelity fluid dynamics, structural mechanics, and/or other performance determination models, (e.g., address needs of additional platforms and technologies).			
Large-Scale Data Analytics: Evolve data engineering techniques for storage, labeling, and analysis of vast data sets; explore automation of artificial intelligence and machine learning assisted design; and demonstrate automated machine learning methods for lifecycle data, (e.g., analysis of sensor data to improve automated target recognition).			
FY 2019 to FY 2020 Increase/Decrease Statement: Level of effort is consistent between FY 2019 and FY 2020. Small changes reflect minor budget fluctuations.			
Accomplishments/Planned Programs Subtotals		8.425	9.858
C. Other Program Funding Summary (\$ in Millions) N/A			
Remarks N/A			
D. Acquisition Strategy N/A			
E. Performance Metrics - Development of next generation engineering methods and design tools - Demonstration and evaluation of next-generation engineering methods and design tools, documented in analyses and technical reports. - Use of ERS engineering methods and design tools by DoD programs or project offices, industry and academia.			

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

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
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	0.000	0.000	74.364	85.223	-	85.223	81.152	84.070	84.002	85.784	Continuing	Continuing
924: High Energy Laser Initiative	0.000	0.000	74.364	85.223	-	85.223	81.152	84.070	84.002	85.784	Continuing	Continuing

Note

This work continues/expands on research initiated by the Missile Defense Agency in PE 0603178C (Weapons Technology) with the goal of focusing on common non-Service/Agency specific improvements in High Energy Laser (HEL) components/systems.

A. Mission Description and Budget Item Justification

This program element funds HEL advanced technology development aimed at translating technology solutions for broadly defined military problems into demonstrated performance pay-offs, increased capabilities, increased supportability, and/or increased affordability. HEL weapons systems have many potential advantages, including speed-of-light time-to-target, high precision, nearly unlimited magazine depth, low cost per kill, and reduced logistics requirements because of no need for stocks of munitions or warheads. As a result, HELs have the potential to perform a wide variety of military missions. Activities conducted under this program element will develop and demonstrate the technology necessary to enable HEL missions across the Department of Defense (DoD).

<u>B. Program Change Summary (\$ in Millions)</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020 Base</u>	<u>FY 2020 OCO</u>	<u>FY 2020 Total</u>
Previous President's Budget	0.000	69.533	75.438	-	75.438
Current President's Budget	0.000	74.364	85.223	-	85.223
Total Adjustments	0.000	4.831	9.785	-	9.785
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	5.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• FFRDC Reduction	-	-0.169	-	-	-
• Other Program Adjustments	-	-	9.785	-	9.785

Change Summary Explanation

The increase in FY 2020 will support the broad area of improved HEL capability, focusing on increased output power, improved beam quality, efficient power and thermal management schemes, and other common component activities that will benefit HEL programs across the DoD Enterprise. Similar research and developmental work is currently being undertaken by the Services/Agencies; therefore, activities within this PE will support and be closely coordinated with other

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
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
DoD HEL efforts directed at specific Service and Agency missions. Moreover, in FY 2020, the Department will initiate the centralization of high energy laser lethality and damage effects research into a single unified database and will develop the Directed Energy Joint Munition Effectiveness Manual.		

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
924: High Energy Laser Initiative	0.000	0.000	74.364	85.223	-	85.223	81.152	84.070	84.002	85.784	Continuing	Continuing
A. Mission Description and Budget Item Justification												
This program element is part of an overall Defense strategy in High Energy Laser (HEL) science and technology development focused on scaling the output power of HELs to reach operationally effective power levels applicable to broad mission areas across the DoD. Efforts will also pursue improvements in common HEL system components such as efficient power and/or thermal management approaches, effective power supplies, and beam combining/beam director designs. This program element complements, and will be closely coordinated with, other DoD HEL efforts directed at specific Service and Agency missions.												
B. Accomplishments/Planned Programs (\$ in Millions)									FY 2018	FY 2019	FY 2020	
Title: High Energy Laser Power Scaling									-	74.364	85.223	
Description: This effort is focused on scaling HEL power levels important to mission areas across the DoD, and leverages and/or builds upon other investments in HEL development.												
FY 2019 Plans: Implement a research strategy to scale the output power of HEL to meet Department-wide mission area needs based on findings from the DoD HEL Roadmap Assessment and other technical sources. Establish key performance metrics based on power, power-in-the-bucket (beam quality), electrical-optical efficiency, including size and weight constraints. Determine appropriate technologies and initiate the development efforts.												
FY 2020 Plans: Continue the base effort of scaling HELs to the 300 kW-class power level. Determine atmospheric effects, such as thermal blooming of higher-power lasers through data collection in the field. In addition, will initiate the centralization of high energy laser lethality and damage effects research into a single unified database and the development of a Directed Energy Joint Munition Effectiveness Manual.												
FY 2019 to FY 2020 Increase/Decrease Statement: The increase in funding supports the broad area of improved HEL capability, focusing on increased output power, improved beam quality, increased electrical-optical efficiency (which drive size, weight and power constraints), and other common component activities that benefit HEL programs across the DoD Enterprise. Activities within this PE will support and be closely coordinated with other DoD HEL efforts directed at specific Service and Agency missions.												
Accomplishments/Planned Programs Subtotals									-	74.364	85.223	
C. Other Program Funding Summary (\$ in Millions)												
N/A												

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603924D8Z / <i>High Energy Laser Advanced Development</i>	Project (Number/Name) 924 / <i>High Energy Laser Initiative</i>
C. Other Program Funding Summary (\$ in Millions) Remarks N/A D. Acquisition Strategy N/A E. Performance Metrics N/A		

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide / BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603941D8Z / <i>Test and Evaluation/Science and Technology</i>
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	519.976	108.958	117.389	175.574	-	175.574	154.520	137.515	133.858	129.539	Continuing	Continuing
091: <i>High Speed Systems Test</i>	143.353	29.314	36.185	96.776	-	96.776	74.590	55.803	48.572	42.865	Continuing	Continuing
092: <i>Spectrum Efficient Technology</i>	50.261	5.633	10.682	9.340	-	9.340	9.725	9.880	10.330	10.486	Continuing	Continuing
093: <i>Electronic Warfare Test</i>	73.364	12.000	12.478	12.808	-	12.808	13.280	13.475	14.052	14.318	Continuing	Continuing
094: <i>Advanced Instrumentation Systems Technology</i>	54.051	4.919	11.517	10.583	-	10.583	11.034	11.213	11.760	12.007	Continuing	Continuing
095: <i>Directed Energy Test</i>	49.141	10.141	8.654	11.032	-	11.032	10.096	10.572	10.932	11.057	Continuing	Continuing
096: <i>C4I & Software Intensive Systems Test</i>	94.515	12.722	12.381	11.297	-	11.297	11.977	12.131	12.637	12.763	Continuing	Continuing
097: <i>Autonomy and Artificial Intelligence Test</i>	33.630	6.888	14.490	11.050	-	11.050	10.648	11.090	11.641	11.873	Continuing	Continuing
098: <i>Cyberspace Test</i>	21.661	5.697	11.002	12.688	-	12.688	13.170	13.351	13.934	14.170	Continuing	Continuing
941: <i>Test & Evaluation for Science & Technology</i>	-	21.644	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

Note

Starting in FY2020, Project 097 title will change FROM "Unmanned and Autonomous Systems Test" TO "Autonomy and Artificial Intelligence Test" to more accurately define and describe project workload in terms of the National Defense Strategy and the Under Secretary of Defense (Research and Engineering) prioritization of Artificial Intelligence and machine learning.

A. Mission Description and Budget Item Justification

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

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603941D8Z I <i>Test and Evaluation/Science and Technology</i>
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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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	89.586	96.389	97.574	-	97.574
Current President's Budget	108.958	117.389	175.574	-	175.574
Total Adjustments	19.372	21.000	78.000	-	78.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	22.000	21.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-2.628	-			
• Programmatic Change	-	-	78.000	-	78.000

Change Summary Explanation

FY2018: Congressional add of +\$22M provided in Division C (Defense Appropriations) of the FY 2018 Consolidated Appropriations Act (P.L. 115-141) accommodates a program increase, to include funding for additive manufacturing. All additional funds included in Project 091, High Speed Systems Test.

FY2019: Congressional add of +\$21M provided in Department of Defense Appropriation Bill (P.L. 115-245) accommodates a program increase, to include funding for additive manufacturing of hypersonic affordability (+\$5M) and advanced technology development (+\$16M). All additional funds included in Project 091, High Speed System Test.

FY 2020: Programmatic change of +\$78M included in Project 091, High Speed Test (Hypersonics).

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
091: High Speed Systems Test	143.353	29.314	36.185	96.776	-	96.776	74.590	55.803	48.572	42.865	Continuing	Continuing

A. Mission Description and Budget Item Justification

High-speed/hypersonic weapons are being developed to ensure the continued military superiority and strike capability of the United States including freedom of movement and freedom of action in areas protected by anti-access/area denial defenses. Current weapon system demonstrations and technology development programs include high-speed and hypersonic air-breathing missiles, maneuvering reentry and boost-glide weapons, hypersonic gun-launched projectiles, and air-breathing space access vehicles. These systems require development of conventional and high-speed turbine, ramjet, scramjet, and combined cycle engines; high temperature materials; thermal protection systems (TPS); and thermal management systems.

The High Speed Systems Test (HSST) project addresses test technology needs including propulsion, aerodynamic and aerothermal testing, so the test community has the technology to support the required test scenarios for concepts under development in the S&T community. The technology developments within the HSST project align with the Department of Defense (DoD) S&T priority investments. As such, the HSST project is developing, validating and transitioning advanced T&E technologies for ground test, open-air range flight test, and advanced computational tools, along with instrumentation and diagnostics systems for use in both ground tests and flight tests of high speed systems.

The HSST project develops technologies to enable robust, accurate, and timely T&E of these future weapon systems. DoD acquisition regulations require weapon systems to undergo a thorough T&E process to detect deficiencies early and to ensure system suitability and survivability. However, the extreme environments in which these weapons operate preclude accurate determination of their performance and operability with today's T&E assets. Current national test capabilities have deficiencies in data accuracy, flight condition replication and simulation, test methods, productivity, modeling and simulation (M&S) fidelity, and range safety.

The HSST mission is to address these national test capability gaps by providing test technology solutions that will enable high-speed and hypersonic weapon systems to be successfully developed through accurate, robust, and efficient T&E.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: High Speed Systems Test	29.314	36.185	96.776	-	96.776
Description: The HSST project continued to advance ground and flight test technologies, techniques, instrumentation, and modeling and simulation capabilities required for the development of high speed air-breathing propulsion and boost-glide weapons. The HSST project continued progress toward addressing the two most significant technology shortfalls in current hypersonic aero propulsion ground test capabilities: clean air heat addition (i.e. non-vitiated air) and variable Mach number test capability. Current production ground test facilities create the high temperature propulsion system inlet conditions necessary for air-breathing scramjet engine testing by burning fuel in the facility airflow supplied to the engine inlet for operation. As demonstrated by a previous HSST test, the resulting vitiated air has different gas properties than clean air found in the atmosphere and thus is not representative of what the vehicle would experience during flight. This significantly affects the engine's performance and operability in the test environment resulting in erroneous					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense			Date: February 2019
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
<p>flight performance predictions. In addition to the ability to test in clean air, a variable Mach number capability is required to “fly the mission” and determine the critical transient operability effects throughout the flight envelope. Incorporation of component technologies, previously developed by the T&E/S&T program, were integrated into a small-scale, clean air, true temperature, and variable Mach number (M4.5-7.5) aero propulsion test facility, called the Hypersonic Aerothermal and Propulsion Clean Air Testbed (HAPCAT). Completion of this facility will demonstrate that the component technologies and their integration have reached Technology Readiness Level (TRL) 6, provide an on-going test asset to the DoD, and reduce risk for construction of a full-scale facility. The Regenerative Storage Heater (RSH), which utilizes yttria-stabilized zirconia bricks, was demonstrated at temperatures in excess of 4500 R, allowing non-vitiated air up to Mach 7.5 conditions to be supplied. Final design and fabrication of the air delivery system (ADS) was completed, which will permit uniform flow into the test cabin with variable pressure and temperature from multiple sources, including the RSH. Upon installation of the ADS in HAPCAT, the facility will undergo checkout runs to validate its operation to support DoD weapon systems.</p> <p>The design for a free-jet, variable Mach nozzle (VMN) for use in HAPCAT was initiated. Such a capability will permit much more accurate simulation of transient operations along a flight trajectory in a free-jet configuration. The design of the VMN will also serve as a risk-reduction effort for a larger-scale VMN for use in the future full-scale facility.</p> <p>Efforts continued on the design, fabrication, and installation of a variable Mach number direct-connect nozzle for hypersonic ground test facilities that will provide flight-equivalent Mach numbers between 4 and 6 at true temperatures. The nozzle utilizes a metallic flexible wall to vary the Mach number while withstanding the high temperatures. It will be integrated into the HAPCAT facility upon completion for checkout.</p> <p>The development of a high-pressure tunable-diode laser absorption spectroscopy (TDLAS) continued for eventual integration into HAPCAT to provide accurate air temperature measurements at high temperatures and pressures, which will be used for facility control and determination of facility conditions. The TDLAS system will have uses in other facilities as well for temperature measurements.</p> <p>The arc heater flow quality aerothermal test technology development progressed toward independently-powered spin-coils to control the physical characteristics of the spinning arc column, its attachment location and duration on electrode surfaces within the arc heater. The effort investigated two different spin-coil designs, one of which was validated for use in the mid-pressure arc heater facility. This effort will improve the service life of the electrodes and improve nozzle flow quality.</p> <p>The HSST project continued research that will provide better prediction and determination of boundary layer growth and transition effects upon hypersonic vehicle performance. Understanding and predicting boundary layer transition represents a critical shortfall in the hypersonic community, as it affects the thermal loads, stability</p>					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense				Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
and control, and overall performance of a vehicle. Tests were conducted using a seven degree cone model to evaluate test techniques and boundary layer transition measurement capabilities between various facilities. Tests of a boost-glide vehicle were completed in a quiet wind tunnel environment and a traditional, “noisy” wind tunnel environment, providing insight into the effects of flow field disturbances on boundary layer transition. Facility flow field characterizations were conducted at the Purdue quiet tunnel and the Large Energy National Shock (LENS) facilities at Calspan University at Buffalo Research Center (CUBRC), enabling more effective comparisons between all the facilities and informing test customers of intrinsic flow features in each facility. The characterizations will also provide insight to boundary layer transition studies in these facilities. The HSST project also conducted testing of a boost-glide vehicle, resulting in critical findings to support future flight tests of the vehicle. The HSST project completed development of a ground based, portable high altitude light detection and ranging (LIDAR) system to measure atmospheric conditions (density, temperature, pressure, wind speed/direction, oxygen/water content) along a hypersonic vehicle’s flight path. This technology is a significant advancement over current methods, which employ balloons carrying sensors to sample the atmosphere. The LIDAR will improve the accuracy of characterizing high altitude atmospheric conditions. This atmospheric data is needed to assess the performance and operability of air-breathing missiles and boost-glide vehicles during development. Testing and demonstration of LIDAR atmospheric sensing was completed and the portable system was transitioned to support test programs at coastal flight test ranges to demonstrate system performance in a maritime environment. The HSST project continued the design and development of a UAV-Based Range capability to support hypersonic flight testing. This capability aims to provide a more agile, flexible, and cost-effective method for providing support to hypersonic flight tests in the areas of telemetry, atmospheric sensing, optical imaging, flight safety, and other fields to aid in the development of hypersonic vehicles. The capability will reduce the requirement and high-costs of the “string of pearls” collection of air, sea, and land resources used for hypersonic flight tests. Several different technologies within the HSST project will be integrated as part of the UAV-Based Range. Development of an airborne version of the already completed ground LIDAR system continued with the design and testing of hardware components for the in-flight demonstration of the system on a crewed aircraft in preparation for implementation on an un-crewed vehicle. Design for integration of the system on-board an unmanned Global Hawk also continued. Progress continued on a high fidelity automated airborne reconfigurable tracking system which seeks to provide high resolution imaging of hypersonic vehicles in flight. The final design was completed including concepts for						

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense			Date: February 2019				
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
<p>integration onto a Global Hawk aircraft. Design for integration of the system on-board an unmanned Global Hawk also continued. This technology will be integrated as part of a UAV-Based Range capability as well. The fabrication and installation of a telemetry capability integrated with a High Altitude, Long Endurance Uncrewed Aerial System (HALE UAS) for a technical demonstration was completed. The system was integrated onto a Global Hawk and was deployed to Hawaii in support of flight testing in the area. Tests were conducted in a hypervelocity shock tunnel on a hollow-cylinder flare test article in order to acquire shock-boundary layer interaction data. Such data will be used to validate computational fluid dynamics (CFD) codes used in the community for hypersonic analyses. The dataset will help advance the state of the art in computational tools.</p> <p>FY 2019 Plans: The HSST project will continue developments to further mature the UAV-Based Range capability through flight demonstration efforts as well as support to hypersonic flight tests as a secondary asset. These developments includes airborne demonstration of the LIDAR system and the optical imaging system on-board manned aircraft and additional airborne testing of the telemetry system on a Global Hawk UAV. The HAPCAT facility will begin initial checkout operations to verify the ability to mix various air supply sources and provide a uniform, steady flow to the test cabin using clean air to support aerothermal, aero-optic, and propulsion testing of hypersonic systems. The use of a variable-Mach number direct connect nozzle will also be demonstrated in the facility. Progress will be made in the design of the variable-Mach number free-jet nozzle for eventual integration into the HAPCAT facility. The development will feed directly into a larger-scale variant for use in the full-scale facility to be built in the future. Additional tests and analysis will be conducted in an effort to construct a methodology for predicting boundary layer transition on hypersonic vehicles through ground testing and computations. This development includes a HIFiRE-5b flight-matching experiment to assess ground-to-flight comparison capabilities and a scale-effects test entry using a boost-glide geometry. Such work will supplement the previous work performed in this area under the HSST project.</p> <p>FY 2020 Base Plans: The HSST project will continue developments to improve hypersonic ground and flight test capabilities to levels required for acquisition programs. Development of the variable-Mach number free-jet nozzle and integration into the HAPCAT facility will continue. Progress will be made in the development of test techniques to determine the combined aerodynamic and aerothermal effects on sensor and seeker performance. Improvements to Thermal</p>							

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense				Date: February 2019		
Appropriation/Budget Activity 0400 / 3		R-1 Program Element (Number/Name) PE 0603941D8Z / <i>Test and Evaluation/ Science and Technology</i>		Project (Number/Name) 091 / <i>High Speed Systems Test</i>		
B. Accomplishments/Planned Programs (\$ in Millions)						
		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Protection System (TPS) test capabilities will be made by developing new test technologies that enable the testing of larger test articles (3x) with more complex geometries for longer test durations. Enhancements to TPS test facilities will also be initiated enabling the simulation of flight trajectories on the ground to better characterize TPS performance in support of hypersonic vehicle design optimization for range, survivability and payload. Flight test infrastructure improvements will continue to enable better data collection including high resolution optics, atmospheric measurements, and terminal scoring capability. These improvements will also enable flexible test scheduling by placing instrumentation onboard a UAV fleet to increase the op tempo of flight tests. Efforts will continue to investigate new flight test techniques, develop new ground test instrumentation, improve and validate CFD codes, and transition HSST technologies to the hypersonic community.						
FY 2019 to FY 2020 Increase/Decrease Statement: Program Adjustments						
Accomplishments/Planned Programs Subtotals		29.314	36.185	96.776	-	96.776
C. Other Program Funding Summary (\$ in Millions)						
N/A						
Remarks						
D. Acquisition Strategy						
N/A						
E. Performance Metrics						
Percentage of T&E/S&T projects progressing satisfactorily toward technical, financial, schedule, and risk mitigation goals.						

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 3					R-1 Program Element (Number/Name) PE 0603941D8Z / <i>Test and Evaluation/ Science and Technology</i>				Project (Number/Name) 092 / <i>Spectrum Efficient Technology</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
092: <i>Spectrum Efficient Technology</i>	50.261	5.633	10.682	9.340	-	9.340	9.725	9.880	10.330	10.486	Continuing	Continuing

A. Mission Description and Budget Item Justification

Weapon systems have become increasingly complex in recent years, resulting in the need for significantly more data to be passed among these systems as well as between the systems and our test infrastructure. A vast amount of data must be collected, transmitted, and analyzed, which requires a large amount of radio frequency (RF) spectrum resources. However, the amount of RF spectrum designated to support test and evaluation (T&E) is decreasing, most notably due to reallocation of spectrum for commercial use. The combination of decreasing RF spectrum and increasing data requirements results in an urgent need to develop test technologies that maximize the use of spectrum resources for Department of Defense (DoD) T&E operations.

The L- and S- Band frequencies are the traditional spectrum allotted for military T&E use. The explosive need for spectrum in the commercial sector has resulted in reallocation of portions of these bands to industry. To compensate, DoD is now authorized to use the C-Band spectrum which offers numerous benefits, including the potential for a large increase in available bandwidth, but the C-Band spectrum comes with technical challenges and regulatory constraints. Most notably, our current test infrastructure for telemetry is not designed to accommodate C-Band and the band is heavily shared for alternate uses. Technologies are required to implement innovative techniques that efficiently facilitate our use of C-Band without a major overhaul to our national test infrastructure. For instance, commercial telemetry transmitters operate in C-Band but do not have the form factor (size, weight and power) nor ruggedized packaging to survive airborne test applications.

Traditional telemetry applications employ streaming telemetry where data is moved one-way from the instrumented system under test to our test range infrastructure. Modern network based telemetry and cellular based telemetry capabilities enable more robust, efficient bidirectional transfer of data. The DoD strategy is to create technologies for implementing a telemetry capability in C-Band, using the legacy L- and S-Bands for both streaming and networked telemetry, and researching the feasibility of using higher frequency bands to augment telemetry operations.

The Spectrum Efficient Technology (SET) project is developing test technologies that enable more efficient use of legacy telemetry bands and expansion into non-traditional areas of the RF and optical spectra at DoD test ranges. The technology development efforts within the SET project have been prioritized to align with Department of Defense guidance on science and technology priority investments. As such, the SET project is focusing on growing data requirements of warfighting systems and the limited availability of spectrum for testing. The SET project is structured to develop test technologies to advance range communications, networked and cellular based telemetry capabilities, and enhanced management of spectrum at DoD test ranges.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Spectrum Efficient Technology	5.633	10.682	9.340	-	9.340
Description: The SET project performed risk reduction on a ruggedized Ethernet switch for airborne systems in support of the Central Test and Evaluation Investment Program (CTEIP) networked telemetry projects. The ruggedized Ethernet switch addresses CTEIP requirements to fully instrument test aircraft with network enable instrumentation packages to support bi-directional telemetry. The ruggedized switch provides the					

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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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
<p>Ethernet backbone on the aircraft which supports the transport of packetized telemetry data from the onboard instrumentation systems to the telemetry transceiver which transmits the data to the control room.</p> <p>The SET project performed risk reduction on a networked data recorder and data transmission scheme in support of CTEIP networked telemetry projects. The networked data recorder addresses 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.</p> <p>A scheme enabling more efficient handling of multiple priority test data and communications between the network router and telemetry receiver was demonstrated showing the capability to assign transmission priority to specific test parameters ensuring critical test data is transmitted using the limited spectral resources available for testing. This technology is required to support CTEIP data transmission requirements and the implementation of a networked telemetry capability.</p> <p>A multi-band transceiver operating in the L/S/C-Band spectrum employing multiple advanced modulation schemes was demonstrated showing the ability to change both the frequency and modulation scheme of the telemetry system in near real time based on telemetry link performance and environmental conditions. This technology determines the performance of the telemetry link and selects the optimal modulation scheme based on current link conditions, accounting for issues such as multipath.</p> <p>The SET project developed technologies to address over-the-horizon telemetry requirements to support the testing of large footprint, long range missiles and hypersonic weapons. An S-Band phased array antenna suitable for mounting on a Global Hawk platform was developed and its antenna gain performance characterized in a high fidelity laboratory environment. A modular digital beam-forming solution to control a phased array antenna and track multiple targets simultaneously was matured. These technologies will significantly reduce the system complexity for an airborne phased array antenna, providing savings in terms of size, weight, and power consumption.</p> <p>Development of a software-based technology solution to accurately characterize RF spectrum utilization on DoD test ranges continued. This technology will develop the interfaces to existing range RF spectrum scheduling and resource management tools and also implement a standard set of spectrum usage metrics to quantify RF spectrum usage based on times of day and test programs. This tool will transition initially to the Air Force Test Center at Edwards AFB to support RF spectrum management activities, aid in the identification of future</p>							

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defence				Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
spectrum requirements, and quantify the impact of inadequate access to spectrum, in terms of program cost and schedule.						
FY 2019 Plans: The SET project will further advance development of technologies required for network telemetry. The ruggedized Ethernet switch for airborne systems in support of CTEIP networked telemetry projects will be demonstrated. 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 continue. Efforts to develop phased array technology for use on the ground will continue. The development of radio technology that can utilize alternate spectrum in the upper frequency bands will continue. The SET project will initiate several efforts to develop the key technology components to use higher frequencies to support telemetry requirements. These efforts will focus on power amplifier, airborne transmitter, and airborne antenna development. The SET project will initiate an effort to develop a steerable, multi-band antenna for airborne platforms. The SET project will initiate several efforts to leverage cellular technologies to support aeronautical telemetry requirements. These efforts will focus on the development of an airborne cellular transceiver suitable for aircraft and missile platforms, ground based transmit and receive antennas, and cellular network management techniques. The SET project will initiate an effort to develop ground based phased array antenna technologies. This technology will increase spectrum efficiency and reuse and modernize the test range infrastructure from single tracking parabolic dish antennas to a more efficient, agile distributed infrastructure.						
FY 2020 Base Plans: The SET project will further advance development of technologies required for network telemetry. Technology enabling the compression of Pulse Code Modulation (PCM) data will transition to support aeronautical telemetry requirements at several test ranges. Efforts to develop spectrum management tools to optimize the use of available RF spectrum and accurately quantify RF spectrum usage on DoD test ranges will complete. The development of a steerable, multi-band antenna for airborne platforms will continue. 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 also continue to leverage cellular technologies to support aeronautical telemetry requirements.						
FY 2019 to FY 2020 Increase/Decrease Statement: Program Adjustments						
Accomplishments/Planned Programs Subtotals		5.633	10.682	9.340	-	9.340

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Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603941D8Z / <i>Test and Evaluation/ Science and Technology</i>	Project (Number/Name) 092 / <i>Spectrum Efficient Technology</i>
C. Other Program Funding Summary (\$ in Millions) N/A		
Remarks		
D. Acquisition Strategy N/A		
E. Performance Metrics Percentage of T&E/S&T projects progressing satisfactorily toward technical, financial, schedule, and risk mitigation goals.		

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
093: Electronic Warfare Test	73.364	12.000	12.478	12.808	-	12.808	13.280	13.475	14.052	14.318	Continuing	Continuing

A. Mission Description and Budget Item Justification

In order to establish dominance in the modern battlespace, our offensive and defensive electronic warfare systems must be capable against advanced radio frequency (RF) directed threats and electro-optic (EO) guided threats, which include infrared (IR) guidance. Ensured dominance in these areas requires more robust test and evaluation (T&E) with technologies that are rapidly adaptable to changing threats.

Readily available, IR seeking, man-portable air defense systems (MANPADS) are difficult to detect and pose an imminent and lethal threat to military aircraft of all types. Our ability to counter such threats is essential to owning the battlespace in theater. Therefore, the ability to test missile warning systems (MWS), hostile fire indicator (HFI) systems, IR countermeasures (IRCM), and advanced threat sensors is critical to our national defense. Additionally, a new generation of enemy RF missile seekers is both currently fielded and in further development, requiring a correspondingly new generation of test technologies to test the latest countermeasures. The T&E community is required to test IRCM and RF countermeasure systems in a repeatable manner with ground-truth data before and after integration into warfighting systems. Without new test technologies, the Department of Defense (DoD) will be unable to perform adequate T&E of advanced warning and countermeasure systems. The technology development efforts within the Electronic Warfare Test (EWT) project have been prioritized to align with DoD guidance on science and technology priority investments. As such, the EWT project is focusing on the test needs in both the EO, including IR, and the RF threat domains. Additionally, development of core test technologies in this area can be leveraged to meet other EO and RF test requirements, such as in fire control systems; intelligence, surveillance and reconnaissance (ISR) sensors, and weapon seekers.

The EWT project develops test technologies to stimulate IRCM and RF system sensors through the high-fidelity simulation of scenes viewed by the sensors. Stimulation can be as simple as testing to see if a system under test responds to an image or as complex as simulating complex battle space phenomena to measure the response of a system under test in a more relevant, cluttered scenario. Simulations and stimulations are used at open air ranges and in installed system test facilities (ISTF), and in hardware-in-the-loop (HWIL) test beds.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Electronic Warfare Test	12.000	12.478	12.808	-	12.808
Description: The EWT project continued to develop high fidelity scene generation technology for both EO and RF environments. Work continued on high temperature IR scene projectors. Work continued on increasing the efficiency of LED pixels for use in IR scene projectors. Work continued on development of interfaces for use of Active Electronically scanned arrays for open air range threat simulators.					
FY 2019 Plans: The EWT project will continue prior year efforts to improve the electronic warfare T&E infrastructure. Technologies to support adaptive EW testing will be investigated. The EWT projects will consider alternative technologies for IR scene projectors that reach higher apparent temperatures. The EWT project will consider					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense				Date: February 2019		
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B. Accomplishments/Planned Programs (\$ in Millions)						
		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
<p>new technologies for lasers or LEDS for open air range IRCM testing. The EWT project will look at developing high speed techniques for converting terrain database images for IR scene generation. The EWT project will also look at surrogate missiles for IRCM open air range testing. The EWT project will look at developing an EW arena to address the “many on many” EW scenarios that need to be tested in a live/virtual/constructive environment.</p> <p><i>FY 2020 Base Plans:</i> 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.</p> <p><i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> Program Adjustments</p>						
Accomplishments/Planned Programs Subtotals		12.000	12.478	12.808	-	12.808
C. Other Program Funding Summary (\$ in Millions) N/A						
Remarks						
D. Acquisition Strategy N/A						
E. Performance Metrics Percentage of T&E/S&T projects progressing satisfactorily toward technical, financial, schedule, and risk mitigation goals.						

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
094: Advanced Instrumentation Systems Technology	54.051	4.919	11.517	10.583	-	10.583	11.034	11.213	11.760	12.007	Continuing	Continuing

A. Mission Description and Budget Item Justification

The Advanced Instrumentation Systems Technology (AIST) project addresses the test technology gaps resulting from emerging weapon systems that need to be tested at Department of Defense (DoD) open air ranges, undersea ranges, installed systems test facilities, hardware-in-the-loop laboratories, and measurement test facilities. Instrumentation requirements for systems under test are increasing exponentially for new weapons systems. Vehicle-borne and warfighter-wearable instrumentation packages are required. This instrumentation is for sensing and collecting critical performance data; determining accurate time, space, position information (TSPI) and attitude information; interfacing with command and control data links; monitoring and reporting system-wide communications; recording human operator physical and cognitive performance; and storing and transmitting data.

The technology development efforts within the AIST project have been prioritized to align with DoD guidance on science and technology (S&T) communities of interest (COIs). The AIST project is focused on supporting technology developments for advanced time, space, position information (TSPI) instrumentation (especially with limited or no availability of the Global Positioning System (GPS)), advanced sensors, advanced energy and power systems for instrumentation, non-intrusive instrumentation, mitigating range encroachment issues, and measuring warfighter physical and cognitive performance. The AIST project addresses requirements for miniaturized, non-intrusive instrumentation suites with increased survivability in harsh environments. Such instrumentation is an urgent need because minimal space is available to add instrumentation to new or existing weapon systems subsequent to their development; furthermore, additional weight and power from instrumentation can adversely affect weapon system signature and performance. Instrumentation for humans-in-the-loop, such as dismounted warfighters, must not adversely affect performance, induce artificiality in the test environment, nor create operational burden. New technologies can be exploited to integrate small, non-intrusive instrumentation into emerging platforms during design and development, and, in some cases, into existing platforms. This class of instrumentation will provide critical system performance data during operational test (OT) and continuous assessment throughout a system's lifecycle. Technology developed under AIST can also benefit training and combat missions by enabling a continual feedback loop between the developer, training staff, operators and commanders.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Advanced Instrumentation Systems Technology	4.919	11.517	10.583	-	10.583
Description: Major thrusts included continuing efforts in advanced sensors, TSPI instrumentation, warfighter physical and cognitive assessment under various workloads and mitigation of test range encroachments. Development completed on a passive imaging technology to derive size, shape, mass, drag coefficients, velocity and vectors for individual fragments during live warhead testing. This technology allows testers to quickly characterize the fragment characteristics and distribution from a munition explosion. This effort transitioned to the U.S. Air Force to support warhead effectiveness and lethality testing. The AIST project completed the development of a system to measure and assess warfighter cognitive performance under realistic conditions during a T&E event. This technology transitioned to the U.S. Army's Test					

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Appropriation/Budget Activity 0400 / 3		R-1 Program Element (Number/Name) PE 0603941D8Z / <i>Test and Evaluation/ Science and Technology</i>		Project (Number/Name) 094 / <i>Advanced Instrumentation Systems Technology</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
<p>& Evaluation Command (ATEC). A personnel tracking system using amplitude modulation (AM) band signals was developed, but requires testing in a relevant environment before transition. The AIST project continued development of technology to evaluate back face deformation of body armor from a blunt trauma event, with final testing planned at Aberdeen Test Center’s Light Armor Range Complex.</p> <p>The AIST project continued an effort to develop a high fidelity model which takes into account the noisier acoustic properties of shallow water environments (120 feet to 900 feet) for littoral T&E. The model will support early evaluation of undersea test range technologies (e.g., hydrophone arrays, new communication signals/modulations, transducers, and portable instrumentation).</p> <p>FY 2019 Plans:</p> <p>The AIST project will initiate development of: multi-disciplinary technologies addressing T&E requirements for countering small unmanned air systems (cUAS) and real-time casualty assessment (RCTA)of warfighter and weapons engagements; sensors to support advanced hypervelocity projectile testing; TSPI data fusion algorithms and technologies; high precision range radar technology to better address current and emerging requirements to track and measure the dynamics of multiple small and large closely spaced objects (e.g., dispensing of sub-munitions, debris, warhead particles, and swarms of independent autonomous airborne vehicles; energy and power for rapidly deployable sea ranges; advanced non-intrusive data management techniques; and mitigation technologies for monitoring effects from electromagnetic interference from solar power towers. The AIST project will complete fiber optic shape sensing technology that accurately provides dynamic measurements during the time history of back face deformation of body armor from a blunt trauma event. AIST will complete development of a high fidelity model for assessing technologies used in undersea littoral test ranges.</p> <p>FY 2020 Base Plans:</p> <p>The AIST project will continue development of: multi-disciplinary technologies addressing T&E requirements for countering small unmanned air systems (UAS) and real-time casualty assessment (RTCA) of warfighter and weapons engagements; sensors to support advanced hypervelocity projectile testing; TSPI data fusion algorithms and technologies; high precision range radar technology; improved energy and power density systems for T&E; advanced non-intrusive data management techniques; and mitigation technologies for monitoring effects from encroachment on test ranges. The AIST project will also investigate technologies to improve methods to measure warfighter cognitive & physical workload.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement:</p>						

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Appropriation/Budget Activity 0400 / 3		R-1 Program Element (Number/Name) PE 0603941D8Z / <i>Test and Evaluation/ Science and Technology</i>		Project (Number/Name) 094 / <i>Advanced Instrumentation Systems Technology</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO
Program Adjustments					
Accomplishments/Planned Programs Subtotals		4.919	11.517	10.583	-
C. Other Program Funding Summary (\$ in Millions) N/A					
Remarks					
D. Acquisition Strategy N/A					
E. Performance Metrics Percentage of T&E/S&T projects progressing satisfactorily toward technical, financial, schedule, and risk mitigation goals.					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
095: Directed Energy Test	49.141	10.141	8.654	11.032	-	11.032	10.096	10.572	10.932	11.057	Continuing	Continuing

A. Mission Description and Budget Item Justification

The Department of Defense (DoD) is exploring the military utility, safety, and suitability of directed energy weapons. A robust test capability to assess directed energy weapons is essential to understanding their effectiveness and limitations, including determining their effectiveness in performing counter improvised explosive device (C-IED) operations. Such assessments will depend upon knowledge acquired through the test and evaluation (T&E) of directed energy technologies and testing of operational concepts. Directed energy weapon technologies, primarily consisting of high energy lasers (HEL) and high powered microwaves (HPM), are outpacing available test capabilities. Traditional test techniques for evaluating conventional munitions (with flight times ranging from seconds to minutes) are not sufficient for the T&E of directed energy weapons that place energy on target instantaneously. Consequently, new test technology solutions are needed to ensure that adequate developmental, live-fire, and operational test capabilities are available when directed energy programs are ready to test.

Directed energy system and component testing requires three principal assessments: (1) energy or power on target; (2) the effects on the target; and (3) the propagation of the directed energy to the target through the atmosphere. In addition, the vulnerabilities of DoD systems to directed energy threats are required to be characterized, such as those requirements captured in Military Standard (MIL-STD)-464C. Equally as important, current test capabilities do not provide the detailed data required to understand U.S. directed energy system performance and effects. The technology development efforts within the Directed Energy Test (DET) project have been prioritized to align with DoD guidance on science and technology priority investments. As such, the DET project is developing the technologies necessary for quantitative assessment of United States (U.S.) HEL and HPM performance, as well as the vulnerability of DoD weapon systems to enemy directed energy threats.

B. Accomplishments/Planned Programs (\$ in Millions)

Title: Directed Energy Test

Description: The DET project continued efforts to measure HEL energy on small targets such as mortars. The effort designed a recoverable mortar prototype to address Army and Navy requirements and an Air Force requirement for a missile-mounted target board. The DET project initiated 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 at 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.

FY 2019 Plans:

FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
10.141	8.654	11.032	-	11.032

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense				Date: February 2019		
Appropriation/Budget Activity 0400 / 3		R-1 Program Element (Number/Name) PE 0603941D8Z / <i>Test and Evaluation/ Science and Technology</i>		Project (Number/Name) 095 / <i>Directed Energy Test</i>		
B. Accomplishments/Planned Programs (\$ in Millions)						
		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
<p>The DET project will continue developments in HEL test technologies to assess and characterize the performance of HEL systems as they engage small targets, such as enemy rockets, missiles, artillery, and unmanned aerial vehicles. The DET project will invest in technologies for assessing the aero-optical effects on HEL propagated from aircraft. The DET project will also expand efforts to instrument UAVs and other targets with HEL target boards for open air range testing.</p> <p>In the HPM area, the DET project will continue measuring the HPM effects on electronics. The DET project will continue to investigate new technologies to further address gaps in the availability of sources for MIL-STD-464C testing. The DET project will invest in surrogate HPM sources for testing HPM lethality on threat representative targets. The DET project will develop X-band sources for use in munitions seeker vulnerability testing. The DET project will invest in technologies for assessing the effects of high power RF on explosives. The DET project will also investigate instrumentation for assessing HPM effects on small UAVs.</p> <p><i>FY 2020 Base Plans:</i></p> <p>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.</p> <p><i>FY 2019 to FY 2020 Increase/Decrease Statement:</i></p> <p>Program Adjustments</p>						
Accomplishments/Planned Programs Subtotals		10.141	8.654	11.032	-	11.032
C. Other Program Funding Summary (\$ in Millions)						
N/A						
Remarks						
D. Acquisition Strategy						
N/A						
E. Performance Metrics						
Percentage of T&E/S&T projects progressing satisfactorily toward technical, financial, schedule, and risk mitigation goals.						

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
096: C4I & Software Intensive Systems Test	94.515	12.722	12.381	11.297	-	11.297	11.977	12.131	12.637	12.763	Continuing	Continuing

A. Mission Description and Budget Item Justification

The Command, Control, Communications, Computers, Intelligence (C4I) and Software Intensive Systems (SIS) (C4T) project addresses test technology gaps in the rapid advancement of C4T warfighting systems. The C4T technology gaps are driven by the more complex environments and distributed systems (e.g. Anti-Access Aerial 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 (Cols). C4T is developing technologies, including leveraging advancements in machine learning, to analyze and evaluate the increasing mass of structured and unstructured data generated by C4I and SIS testing. The technologies are required when testing sensor platforms, command and control systems and weapon platforms that support the kill chain in a Joint operation. These systems must be evaluated for their ability to provide the accurate, timely transfer of data (e.g. target tracks, weapons allocation, mission tasking, and situational awareness) as the data passes among the Services and coalition participants.

The technologies within C4T will remove undesired distributed testing biases while improving test agility and the tester's ability to effectively support knowledge management, rapid analysis of "Big Data," and automated test reporting. The C4T project advances test automation features (test planning, test execution, Big Data collection, analysis, and visualization) that enable the virtual integration of Department of Defense (DoD) weapon laboratories and open air ranges. Using Modeling and Simulation (M&S) along with hardware-in-the-loop (HWIL) laboratories, the effectiveness of Joint missions can be assessed in terms of system-of-systems interoperability and effectiveness in executing Joint mission operations, including testing of weapons and C4I and SIS systems accessing and providing information.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: C4I and Software Intensive Systems Test	12.722	12.381	11.297	-	11.297
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). The C4T project completed the development of near-real time automated multi-band infrared target segmentation technology using state-of-the-art neural network and deep learning based algorithms. The C4T project developed M&S technologies to support real-time assessments of complex environments such as undersea environments. These technologies provided an acoustic propagation model, both narrow and broad band, of sufficient fidelity to test torpedo performance in various maritime tactical environments. The model included a real-time simulation/emulation system for testing torpedo sonar systems in multiple bathymetry, biological and threat environments. The C4T project developed technologies to provide a reliable, fast, and cost-effective approach that enables direct injection Live Virtual Constructive (LVC) testing of next generation weapon systems. These technologies					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense			Date: February 2019				
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
<p>will enable live assets to sense and respond to the latest threat stimulus without regard to whether the stimulus is real or synthetic.</p> <p>The C4T project developed a configuration optimization of test support networks. Technologies included planning expeditionary tests, managing bandwidth and spectrum contention with a networked system under test, managing battery consumption, providing Real-Time Casualty Assessment (RTCA) data during live tests and providing continuous re-planning capability. These technologies will address deficiencies in Army Operational Test (OT) for network-enabled technologies.</p> <p>The C4T project initiated the development of deep neutral network technologies for real-time Automated Target Recognition (ATR) using real and synthetic data. These technologies are being developed to support Unmanned Aerial Vehicle (UAV) target recognition.</p> <p>FY 2019 Plans:</p> <p>The C4T project will continue on-going test technology developments. The C4T project will continue developing C4I and SIS technologies to support complex and distributed environments assessing DoD platforms employing “Big Data” techniques with a specific focus on tactical systems and warfighter systems in a net-enabled, dynamic environment.</p> <p>The C4T project will continue development on semantic analysis of large structured and unstructured data sets. These technology developments will include the ability to process unstructured test data into a structured format for analysis using D2D algorithms. The C4T project will continue work on the correlation and analysis of "Big Data" from multiple sources. Development of techniques to automate the reuse of knowledge to enable continuous developmental testing throughout the lifecycle of weapon systems will continue.</p> <p>The C4T project will continue to develop technologies that mitigate data biases introduced by the test infrastructure. The C4T project will continue on LVC technologies for use by C4I systems to utilize a synthetic battlespace environment to augment the open-air range with vast simulated areas, frequency ranges, and transmitter entities for T&E in contested/dense communications environments. Multi-Level Security (MLS) and Cross Domain Solution (CDS) technologies will be investigated with the goals of improving the automation of preparing test data for analysis as well as facilitating automated sharing of information across all security enclaves.</p> <p>FY 2020 Base Plans:</p> <p>The C4T project will investigate M&S technologies to support emulation and stimulation of networks for conducting T&E. The C4T project development will focus on the verification and validation (V&V) of the M&S test environment across battlespace environments in support of both Developmental Test (DT) and OT. The</p>							

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense				Date: February 2019	
Appropriation/Budget Activity 0400 / 3		R-1 Program Element (Number/Name) PE 0603941D8Z / <i>Test and Evaluation/ Science and Technology</i>		Project (Number/Name) 096 / <i>C4I & Software Intensive Systems Test</i>	

<u>B. Accomplishments/Planned Programs (\$ in Millions)</u>	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
<p>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. The development of LVC technologies in support of T&E of 5th generation aircraft will also continue. The C4T project will also focus on: testing warfighter systems employing agile communications, effectiveness evaluation in a mission context, analytics for database intensive warfighter systems, and automated test planning and assessments.</p> <p><i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> Program Adjustments</p>					
Accomplishments/Planned Programs Subtotals	12.722	12.381	11.297	-	11.297

<p><u>C. Other Program Funding Summary (\$ in Millions)</u> N/A</p> <p><u>Remarks</u></p>
<p><u>D. Acquisition Strategy</u> N/A</p>
<p><u>E. Performance Metrics</u> Percentage of T&E/S&T projects progressing satisfactorily toward technical, financial, schedule, and risk mitigation goals.</p>

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 3					R-1 Program Element (Number/Name) PE 0603941D8Z / <i>Test and Evaluation/ Science and Technology</i>				Project (Number/Name) 097 / <i>Autonomy and Artificial Intelligence Test</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
097: <i>Autonomy and Artificial Intelligence Test</i>	33.630	6.888	14.490	11.050	-	11.050	10.648	11.090	11.641	11.873	Continuing	Continuing

Note

Starting in FY2020, Project 097 title will change FROM "Unmanned and Autonomous Systems Test" TO "Autonomy and Artificial Intelligence Test" to more accurately define and describe project workload in terms of the National Defense Strategy and the Under Secretary of Defense (Research and Engineering) prioritization of Artificial Intelligence and machine learning.

A. Mission Description and Budget Item Justification

Unmanned and autonomous systems support every domain of warfare -- operating in space, in air, on land, on the sea surface, undersea and in subterranean conditions to support a vast variety of missions. The emergence of Artificial Intelligence (AI) brings a host of revolutionary capabilities that will profoundly influence warfare. The UAST project addresses current and emerging challenges associated with the test and evaluation (T&E) of unmanned systems, particularly in testing autonomy, artificial intelligence, and machine learning. As such, the UAST project is developing test technologies to simulate, stimulate, instrument, measure, and assess an autonomous system's ability to perceive its environment, process information, adapt to dynamic conditions, make decisions, and effectively act on those decisions in the context of mission execution.

The UAST project will provide the test technologies to effectively measure performance and characterize risk, thereby increasing warfighter trust in autonomous systems and artificial intelligence tools. Current DoD test capabilities and methodologies are insufficient to address the testing of increasingly autonomous units operating in unstructured, dynamic, battlespace environments. Furthermore, advancements are being made in developing collaborating, system-of-autonomous-systems that will work in concert as a swarm or pack and in close proximity with humans. New test technologies are needed to stress the collective set of autonomous systems under realistic conditions, predict emergent behavior of autonomous systems, emulate the complex environment, and assess mission performance of these highly coupled and artificially intelligent systems.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Autonomy and Artificial Intelligence Test	6.888	14.490	11.050	-	11.050
Description: The UAST project continued test technology development supporting the near term challenges identified in the 2013–2038 DoD Unmanned Systems Integrated Roadmap, such as, integrating DoD unmanned systems within the National Airspace and safely operating unmanned aerial systems within the Major Range and Test Facility Bases (MRTFB). The UAST project collaborated with the Autonomy Community of Interest (COI) Test and Evaluation, Verification and Validation Working Group to ensure that the UAST project is investing in technologies relevant to the future of autonomous systems. The UAST project explored technologies required for T&E of emerging UAS architectures, functional components, and interfaces. The UAST project emphasized autonomy test technologies that can be integrated					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense			Date: February 2019				
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
<p>for use in a Test and Training Enabling Architecture (TENA) environment within the MRTFB. The UAST project continued investments in robustness testing technology to detect and predict vulnerabilities and failures within UAS software. The UAST project continued developments to automatically predict test vehicle collision potentials and cue test range controllers to take corrective action. These technologies will also prevent the test vehicle from violating flight envelopes, range boundaries, and warning areas. The UAST project initiated an effort to develop a software tool that will enable testers to monitor the internal autonomous processing states of a system under test without interfering with its operations or requiring modification to the system’s software or hardware. The UAST project completed efforts that rapidly identify challenging test scenarios for an undersea unmanned vehicle (UUV) under test. The effort identified performance boundaries for autonomy as they relate to the environment, mission, and vehicle state spaces; this technology transitioned to the Naval Undersea Warfare Center-Keyport.</p> <p>The UAST project has initiated development of technology to address the T&E of ground and air autonomy using optimization algorithms to rapidly generate salient test scenarios.</p> <p>FY 2019 Plans:</p> <p>The UAST project name will be changed to “Autonomy and Artificial Intelligence (AI) Test (AAIT)” to better reflect the scope and focus on the emerging importance of testing all aspects and applications of artificial intelligence in DoD systems. The AAIT project will continue to initiate and develop technologies to support autonomous system test planning, autonomous system test execution, and autonomous system performance assessment. Efforts within test planning will include predicting autonomous behavior for testing and assuring thorough testing of autonomous systems. Investments in test execution will include: enhancing safety of autonomous system testing; creating test environments that are complex, immersive, and reactive; and adapting ranges to cognitive, autonomous system testing. Developments under performance assessment will include: testing and evaluating UAS-to-UAS and human-to-UAS interactions and measuring autonomous system reliability.</p> <p>The AAIT project will investigate new technologies specifically for creating faster-than-real-time versions of autonomies. Developing this technology will allow multiple copies of a black-box autonomy to be run in modeled environments to gather statistically significant information regarding the performance boundaries of an autonomy.</p> <p>The AAIT project will complete development of technologies that automatically learn conditions for activating vulnerabilities deep within an autonomous system, using machine learning and backward chaining techniques to determine system level inputs that induce failure.</p> <p>FY 2020 Base Plans:</p>							

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense				Date: February 2019	
Appropriation/Budget Activity 0400 / 3		R-1 Program Element (Number/Name) PE 0603941D8Z / <i>Test and Evaluation/ Science and Technology</i>		Project (Number/Name) 097 / <i>Autonomy and Artificial Intelligence Test</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO
<p>The AAIT project will continue to initiate and develop technologies to support autonomous system test planning, autonomous system test execution, and autonomous system performance assessment. Efforts within test planning and assessment will transition to multiple autonomy test capabilities under development in the Central Test & Evaluation Investment Program (CTEIP) and at DoD test ranges and laboratories.</p> <p><i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> Program Adjustments</p>					
Accomplishments/Planned Programs Subtotals		6.888	14.490	11.050	-
C. Other Program Funding Summary (\$ in Millions)					
N/A					
Remarks					
D. Acquisition Strategy					
N/A					
E. Performance Metrics					
Percentage of T&E/S&T projects progressing satisfactorily toward technical, financial, schedule, and risk mitigation goals.					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 3					R-1 Program Element (Number/Name) PE 0603941D8Z / <i>Test and Evaluation/ Science and Technology</i>				Project (Number/Name) 098 / <i>Cyberspace Test</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
098: <i>Cyberspace Test</i>	21.661	5.697	11.002	12.688	-	12.688	13.170	13.351	13.934	14.170	Continuing	Continuing

A. Mission Description and Budget Item Justification

The Department of Defense (DoD) ability to use cyberspace for rapid communication and information sharing in support of operations is a critical enabler of DoD military missions. Advancements in utilizing cyberspace are outpacing the technologies needed for test and evaluation (T&E). The Cyberspace Test Technology (CTT) project develops advanced technologies and methodologies to test and evaluate DoD capabilities and information networks to defend and conduct full-spectrum military operations across cyberspace. Current cyberspace T&E capabilities are insufficient to support the continual experimental, contractor, developmental, operational, and live-fire testing requirements of warfighter systems operating in cyberspace. Many of the test tools and infrastructure items required for systems in cyberspace will require advancement and maturation of nascent test technologies. The CTT project will address test technology shortfalls in cyberspace testing, including planning cyberspace tests, creating representative cyberspace threats and test environments, executing cyberspace tests, and performing cyberspace test analysis and evaluation.

B. Accomplishments/Planned Programs (\$ in Millions)

Title: Cyberspace Test

Description: Transitioned an automated sanitization framework with assured capability for verifying sanitization of cyber range components to an additional cyber test range customer beyond the National Cyber Range. The CTT project continued development of technologies to detect, monitor, and analyze malware behavior during cyber-attacks in a virtualized T&E environment. CTT completed development of tools to measure, classify, and emulate cyberspace threat actors for T&E.

FY 2019 Plans:

The CTT project will pursue technology developments addressing needs for three domains – Cyber-Physical Systems, Tactical Edge Networks, and Enterprise Information Systems. In Cyber Physical Systems, the CTT project will develop hypervisors/emulators for Kinetic Systems and Cyber Physical Networks, instrumentation for cyberspace data collection, improved cyberspace analysis tools that show real time effects of cyberspace attacks on cyber-physical systems, and cyber Test Execution Tools. In the Tactical Edge networks domain, the CTT project will develop scalable cyberspace test environments, develop tools for mapping complex systems in test networks, and tools for visualization. In Enterprise Information Systems, the CTT project will develop emulated Cyberspace threats, develop tools for cyberspace threat attack control, develop tools for testing

FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
5.697	11.002	12.688	-	12.688

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense				Date: February 2019		
Appropriation/Budget Activity 0400 / 3		R-1 Program Element (Number/Name) PE 0603941D8Z / <i>Test and Evaluation/ Science and Technology</i>		Project (Number/Name) 098 / <i>Cyberspace Test</i>		
B. Accomplishments/Planned Programs (\$ in Millions)						
		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
resiliency of infrastructure and systems, and develop artificial intelligent analysis for enterprise threat detection and mitigation.						
<i>FY 2020 Base Plans:</i> The CTT project will continue to pursue technology developments addressing needs in Cyber-Physical Systems, in Tactical Edge Networks, and in Enterprise Information Systems.						
<i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> Program Adjustments						
Accomplishments/Planned Programs Subtotals		5.697	11.002	12.688	-	12.688
C. Other Program Funding Summary (\$ in Millions)						
N/A						
Remarks						
D. Acquisition Strategy						
N/A						
E. Performance Metrics						
Percentage of T&E/S&T projects progressing satisfactorily toward technical, financial, schedule, and risk mitigation goals.						

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 3					R-1 Program Element (Number/Name) PE 0603941D8Z / <i>Test and Evaluation/ Science and Technology</i>				Project (Number/Name) 941 / <i>Test & Evaluation for Science & Technology</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
941: <i>Test & Evaluation for Science & Technology</i>	-	21.644	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

A. Mission Description and Budget Item Justification

Hypersonic programs need insight on aerothermal effects of their system at high Mach (15+ Mach) to optimize their design and maximize performance. These programs need insight on dynamic events (shroud separation, etc.) at high velocities. Shock tunnels are used to evaluate plasma effects (nose tip & heat shield ablation), control surface performance, boundary layer transition (laminar–turbulent transition), and dynamic events at high Mach number. The Rapid Insertion of Test Technology (RITT) project addressed immediate test technology needs enabling the test community to support required test scenarios for hypersonic concepts under development in the science and technology (S&T) community. This project enabled the development of near-term test technology solutions to test capability shortfalls in support of ongoing hypersonic technology demonstrators. These test technology developments aligned directly with the National Defense Strategy (NDS) in support of hypersonics. RITT developed rapid ground test technology solutions in high velocity, high enthalpy test environments directly supporting ongoing hypersonic demonstrator development. The RITT project completed advanced test and evaluation (T&E) technologies for ground test, test instrumentation, and diagnostics systems for use when testing hypersonic systems in high velocity, high enthalpy test environments.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Test & Evaluation for Science & Technology	21.644	0.000	0.000	0.000	0.000
Description: Completed technology development to upgrade the high-pressure, vacuum, and data systems for the CUBRC Large Energy National Shock (LENS) Tunnels enabling the efficient high productivity operation for flight conditions at Mach 4 to 9. Completed improved intrusive and non-intrusive measurements in hypersonic flow fields aiding vehicle design of ongoing hypersonic technology demonstrators. Technology development creating a new force balance capable of directly measuring force and moment components of an X-51 scale hypersonic vehicle was completed enabling the direct force measurements at flight conditions to compare with flight test data and computationally predicted performance data.					
FY 2019 Plans: Transition program support and technology development funding to relevant projects.					
FY 2020 Base Plans: N/A					
FY 2020 OCO Plans:					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense				Date: February 2019	
Appropriation/Budget Activity 0400 / 3		R-1 Program Element (Number/Name) PE 0603941D8Z / <i>Test and Evaluation/ Science and Technology</i>		Project (Number/Name) 941 / <i>Test & Evaluation for Science & Technology</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO
N/A					
Accomplishments/Planned Programs Subtotals		21.644	0.000	0.000	0.000
C. Other Program Funding Summary (\$ in Millions)					
N/A					
Remarks					
D. Acquisition Strategy					
N/A					
E. Performance Metrics					
Project transition					

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 3: Advanced Technology Development (ATD)</i>					R-1 Program Element (Number/Name) PE 0603950D8Z I <i>National Security Innovation Network</i>							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	0.000	0.000	0.000	25.000	-	25.000	0.000	0.000	0.000	0.000	Continuing	Continuing
845: <i>National Security Innovation Network</i>	0.000	0.000	0.000	25.000	-	25.000	0.000	0.000	0.000	0.000	Continuing	Continuing

Note

This is a new Program Element.

Prior year funds under its previous MD5 nomenclature in PE 0603580D8Z/607 received FY 2016 (\$5.000 million), FY 2017 (\$25.000 million), FY 2018 (\$25.500 million), and FY 2019 (\$15.000 million) as a Congressional interest program.

A. Mission Description and Budget Item Justification

The National Security Innovation Network (NSIN), previously executed under the name of the MD5 National Security Technology Accelerator (MD5), is a program office within the Office of the Undersecretary of Defense for Research and Engineering (OUSD(R&E)) and aligned under the Defense Innovation Unit (DIU). NSIN seeks to develop deep partnerships between the Department of Defense (DoD) and non-traditional problem-solving partners to include students and faculty at colleges and universities. The speed and reactivity of the modern technology-threat environment challenges the traditional top-down model of defense problem-solving and capability development. Mitigating these challenges require developing internal workforce and organizational competencies related to problem framing, knowledge and resource sharing, and non-traditional partnerships. Consistent with the National Defense Strategy, and FY 2020 OMB/OSTP research and development budget priorities for sustaining a military technological advantage, NSIN has a portfolio of innovation efforts that (1) accelerates capability development leveraging non-traditional collaborators and novel approaches, (2) augments the National Security Innovation Base (NSIB) through commercialization of DoD lab technology, and (3) enhances the DoD workforce through programs that develop new ways of solving critical problems.

This program seeks to maintain the long-term competitive advantage for the U.S. military over adversaries by increasing interactions between uniformed and civilian employees of the DoD with innovators and entrepreneurs outside of the DoD. This is accomplished by providing training and tools to these DoD “intrapreneurs” enabling them to find new ways to identify, frame, and solve problems as well as opening avenues to implement the solutions they create. Additionally, the programs executed create opportunities for external innovators and entrepreneurs to be exposed to DoD problems and demonstrate possible solutions.

NSIN carries out its mission via three portfolios of effort: Service, Collaboration, and Acceleration. The Service Portfolio is specifically designed to create new pathways to national security service for entrepreneurs and technologists that want to work with the DoD to solve problems in non-traditional ways. Collaboration provides problem-solving and new ideation spaces or Maker Centers for warfighters, academia and early-stage ventures to collectively identify novel applications and concepts to DoD problem sets. Acceleration programs that identify opportunities inside DoD that can be commercialized, or apply technology relevant to warfighter problem sets and advance the novel applications or solutions are created within the Collaboration Portfolio.

NSIN, under its previous MD5 nomenclature, has been a Congressional interest program that has received funding in FY 2016 (\$5.000 million), FY 2017 (\$25.000 million), FY 2018 (\$25.500 million), and FY 2019 (\$15.000 million).

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603950D8Z I <i>National Security Innovation Network</i>
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B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	0.000	0.000	0.000	-	0.000
Current President's Budget	0.000	0.000	25.000	-	25.000
Total Adjustments	0.000	0.000	25.000	-	25.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• FFRDC Reductions	0.000	0.000	-	-	-
• Other Program Adjustments	-	-	25.000	-	25.000

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

Project: 845: *National Security Innovation Network*

Congressional Add: *N/A*

Congressional Add Subtotals for Project: 845

Congressional Add Totals for all Projects

FY 2018	FY 2019
0.000	0.000
0.000	0.000
0.000	0.000

Change Summary Explanation

The FY 2020 increase of \$25.000 million will fund three portfolios of effort: Service, Collaboration, and Acceleration designed to create new pathways to national security service to solve DoD problems in non-traditional ways.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
845: National Security Innovation Network	0.000	0.000	0.000	25.000	-	25.000	0.000	0.000	0.000	0.000	Continuing	Continuing

Note

This is a new Program Element.

Prior year funds under its previous MD5 nomenclature in PE 0603580D8Z/607 received FY 2016 (\$5.000 million), FY 2017 (\$25.000 million), FY 2018 (\$25.500 million), and FY 2019 (\$15.000 million) as a Congressional interest program.

A. Mission Description and Budget Item Justification

The National Security Innovation Network (NSIN), previously executed under the name of the MD5 National Security Technology Accelerator (MD5), is a program office within the Office of the Undersecretary of Defense for Research and Engineering (OUSD(R&E)) and aligned under the Defense Innovation Unit (DIU). NSIN seeks to develop deep partnerships between the Department of Defense (DoD) and non-traditional problem-solving partners to include students and faculty at colleges and universities. The speed and reactivity of the modern technology-threat environment challenges the traditional top-down model of defense problem-solving and capability development. Mitigating these challenges require developing internal workforce and organizational competencies related to problem framing, knowledge and resource sharing, and non-traditional partnerships. Consistent with the National Defense Strategy, and FY 2020 OMB/OSTP research and development budget priorities for sustaining a military technological advantage, NSIN has a portfolio of innovation efforts that (1) accelerates capability development leveraging non-traditional collaborators and novel approaches, (2) augments the National Security Innovation Base (NSIB) through commercialization of DoD lab technology, and (3) enhances the DoD workforce through programs that develop new ways of solving critical problems.

This program seeks to maintain the long-term competitive advantage for the U.S. military over adversaries by increasing interactions between uniformed and civilian employees of the DoD with innovators and entrepreneurs outside of the DoD. This is accomplished by providing training and tools to these DoD "intrapreneurs" enabling them to find new ways to identify, frame, and solve problems as well as opening avenues to implement the solutions they create. Additionally, the programs executed create opportunities for external innovators and entrepreneurs to be exposed to DoD problems and demonstrate possible solutions.

NSIN, under its previous MD5 nomenclature, has been a Congressional interest program that has received funding in FY 2016 (\$5.000 million), FY 2017 (\$25.000 million), FY 2018 (\$25.500 million), and FY 2019 (\$15.000 million).

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: National Security Innovation Network (NSIN)	0.000	0.000	25.000	0.000	25.000
Description: NSIN carries out its mission via three portfolios of effort: Service, Collaboration, and Acceleration. The Service Portfolio is specifically designed to create new pathways to national security service for entrepreneurs and technologists that want to work with the DoD to solve problems in non-traditional ways.					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense				Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Collaboration provides problem-solving and new ideation spaces or Maker Centers for warfighters, academia and early-stage ventures to collectively identify novel applications and concepts to DoD problem sets. Acceleration programs identify opportunities inside the DoD that can be commercialized, or apply technology relevant to warfighter problem sets and advance the novel applications or solutions are created within the Collaboration Portfolio. FY 2019 Plans: N/A FY 2020 Base Plans: Funding in FY 2020 will be utilized to expand the number of regional hubs and partner universities within the National Security Innovation Network (formerly the MD5 National Security Technology Accelerator). Specifically, NSIN will focus on programs related to producing novel applications and solutions for end users and accelerating technology transfer and transition through university partners and the DoD Labs, including: 1. Launching the National Security Academic Accelerator (NSA2) Network with more than 10 university partners and a goal to launch more than 30 dual-use ventures; 2. Establishing four new regional hubs and placement of three new Program Directors with key, Tier-1 university partners; 3. Completion of 10 Hackathons and delivery of Hacking for Defense (H4D) at up to 25 universities in Academic Year 2020-2021, resulting in more than 15 minimum viable products delivered to DoD end users; 4. Three (3) Catalyst program iterations that transition five (5) commercially viable technologies to DoD Major commands (MAJCOMS); 5. Close collaboration with the Defense Manufacturing Institutes to establish a national network of basic and advanced rapid prototyping facilities to increase commercialization of potential dual-use solutions. FY 2020 OCO Plans: N/A FY 2019 to FY 2020 Increase/Decrease Statement: The increase of \$25.000 million will fund three portfolios of effort: Service, Collaboration, and Acceleration designed to create new pathways to national security service to solve DoD problems in non-traditional ways.						
Accomplishments/Planned Programs Subtotals		0.000	0.000	25.000	0.000	25.000

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603950D8Z / <i>National Security Innovation Network</i>	Project (Number/Name) 845 / <i>National Security Innovation Network</i>	
		FY 2018	FY 2019
Congressional Add: N/A		0.000	0.000
FY 2018 Accomplishments: N/A			
FY 2019 Plans: N/A			
Congressional Adds Subtotals		0.000	0.000

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

N/A

Remarks

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Key performance indicator 1: Year over Year Growth of Entrants into the NSIN virtual Platform (Goal of >25%)

Key performance indicator 2: Annual Savings from Non-Traditional Problem-Solving Methods (Goal of 10x NSIN Budget)

Key performance indicator 3: Annual Solution Adoption Rate (Goal of >75%)

Key performance indicator 4: Year over Year Growth for Technologies Transitioned from DoD Labs (goal of >25%)

Key performance indicator 5: Annual Number of Dual-Use Ventures Launched with Follow-On Funding (Goal of >15)

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity					R-1 Program Element (Number/Name)							
0400: Research, Development, Test & Evaluation, Defense-Wide / BA 3: Advanced Technology Development (ATD)					PE 0604055D8Z / Operational Energy Capability Improvement							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	39.788	45.478	70.536	-	70.536	41.261	41.897	42.657	43.562	Continuing	Continuing
455: Operational Energy Capability Improvement	-	39.788	45.478	70.536	-	70.536	41.261	41.897	42.657	43.562	Continuing	Continuing

A. Mission Description and Budget Item Justification

The basic mission of this program element (PE) is to fund innovation to improve the Department of Defense's (DoD) operational effectiveness via targeted operational energy science and technology (S&T) investments. The Operational Energy Capability Improvement Fund (OECIF) incentivizes S&T to promote long term change in DoD capabilities so they are better aligned with the Operational Energy Strategy. OECIF generally fosters innovation to improve operational energy performance and has two key mission aspects: first, to develop operational energy technologies and practices that will improve DoD military capabilities and possibly reduce costs; and second, to establish within and among the military Services institutional momentum to continue those innovations.

OECIF funds serve as "seed money" to start or consolidate promising operational energy innovation to be sustained by the Services; therefore, OECIF generally emphasizes supporting or establishing transitions rather than one-off projects. OECIF investments also show areas of Departmental level interest. The increase in OECIF funding for FY 2020 is aimed to help shape Service investments across six core functional areas within this operational energy domain: Space Solar Collection, Power Beaming Transmission, Power Beaming Reception, Receiver Power Distribution, Architecture Analytics, and Supporting Technologies.

It is imperative that DoD sustain a competitive position to innovate and manage stealthy and portable power beaming initiatives which provide freedom of movement for the warfighter. OECIF projects are selected annually from Service and Combatant Command proposals that align with the Department's 2016 Operational Energy Strategy and support that fiscal year's OECIF theme. The theme reflects the Department's priorities and focuses S&T investments. The Department is due for a new Operational Energy Strategy, and OECIF is actively shaping and contributing to the Innovation sections. Ultimately, the true value of an OECIF project is dependent on a successful transition to the Warfighter. The benefits may be realized through materiel efforts (fielded equipment, enhanced sub-systems) or non-materiel improvements (i.e., modeling and simulations capabilities, education and training, and development of standards). The overall aim is to improve the operational effectiveness of the Joint Force.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0604055D8Z I <i>Operational Energy Capability Improvement</i>
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B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	38.403	40.582	40.652	-	40.652
Current President's Budget	39.788	45.478	70.536	-	70.536
Total Adjustments	1.385	4.896	29.884	-	29.884
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	2.500	5.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-1.041	-			
• FFRDC Reduction	-0.074	-0.104	-	-	-
• FY 2020 Program Enhancement	-	-	30.000	-	30.000
• Other Program Adjustments	-	-	-0.116	-	-0.116

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

Project: 455: *Operational Energy Capability Improvement*

Congressional Add: *Operational Energy Capability Improvement Program Increase*

Congressional Add Subtotals for Project: 455

Congressional Add Totals for all Projects

FY 2018	FY 2019
2.500	5.000
2.500	5.000
2.500	5.000

Change Summary Explanation

Program adjustments are consistent with higher priority DoD requirements. The increase in OECIF funding for FY 2020 is aimed to help shape Service investment in Space Solar Advanced Technology. Near-peer competitors are overmatching DoD in power beaming and space solar technologies for battlefield advantage, necessitating a critical OECIF effort to address the shortfalls. Per the findings and recommendations of the recent DoD study "Opportunities and Challenges for Space Solar for Remote Installations," measured, comprehensive investments in Advanced Technology Development will be made in six focus areas: (1) Space Solar Collection; (2) Power Beaming Transmission; (3) Power Beaming Reception; (4) Receiver Power Distribution; (5) Architecture Analytics; and (6) Integrating Technologies.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 3					R-1 Program Element (Number/Name) PE 0604055D8Z / Operational Energy Capability Improvement				Project (Number/Name) 455 / Operational Energy Capability Improvement			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
455: Operational Energy Capability Improvement	-	39.788	45.478	70.536	-	70.536	41.261	41.897	42.657	43.562	Continuing	Continuing
A. Mission Description and Budget Item Justification												
<p>The Operational Energy Capability Improvement Fund (OECIF) incentivizes science and technology (S&T) to promote long-term change in DoD capabilities so they are better aligned with the Operational Energy Strategy. OECIF generally fosters innovation to improve operational energy performance and has two key mission aspects: first, to develop operational energy technologies and practices that will improve DoD military capabilities and possibly reduce costs; and second, to establish within the military Services institutional momentum to continue those innovations. OECIF serves as “seed money” to start or consolidate promising operational energy innovation to be sustained by the Services. Accordingly, OECIF generally emphasizes supporting or establishing programs rather than one-off projects.</p> <p>In FY 2018, the OECIF program was realigned from the Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics (OUSD(AT&L)) to the Office of the Under Secretary of Defense for Research and Engineering (OUSD(R&E)).</p>												
B. Accomplishments/Planned Programs (\$ in Millions)									FY 2018	FY 2019	FY 2020	
Title: Operational Energy Capability Improvement Fund (OECIF)									37.288	40.478	70.536	
FY 2019 Plans: Fund new OECIF initiatives and continue established efforts. OECIF will self-fund necessary overhead from the program baseline, approximately \$5.000 million annually, to include program management, business reform tools, and strategic partnerships, etc.												
Established efforts include: • The FY 2013 OECIF project, Tactical Microgrid Standardization, will submit a draft Military Standard (MIL-STD) to the Defense Standardization Program Office for approval. A multi-national demonstration is planned for inter-operability among the North Atlantic Treaty Organization (NATO) partners showing applicability of the standard as part of the Capable Logistician 2019 exercise. • FY 2014 OECIF projects are focused on analytical methods and tools for considering operational energy in DoD planning and decision processes. Analytic tools were developed to consider energy vulnerability during the Joint Planning Process. Spring warfighter evaluations and training are planned. DoD-wide model, scenario, and data updates continue with new model versions scheduled to be released in October 2019. Analytical tool investment underpins the Congressionally mandated energy key performance parameter in addition to warfighting battlefield tools.												

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense			Date: February 2019		
Appropriation/Budget Activity 0400 / 3		R-1 Program Element (Number/Name) PE 0604055D8Z / <i>Operational Energy Capability Improvement</i>		Project (Number/Name) 455 / <i>Operational Energy Capability Improvement</i>	
B. Accomplishments/Planned Programs (\$ in Millions)			FY 2018	FY 2019	FY 2020
<ul style="list-style-type: none"> • FY 2015 OECIF tactical vehicle improvement projects completed the final year of OECIF funding. One effort completed a critical milestone for procurement testing and successfully identified Program Manager Terminal High Altitude Area Defense (PM THAAD) as its first transition partner. A system demonstration is planned for FY 2019. Battlefield electrification yields increased operating longevity in addition to decreased mean-time between failure and significantly less frequent refueling requirements. • FY 2016 OECIF projects focused on improving the operational energy performance of unmanned aerial, surface, undersea and ground vehicles. Multiple projects will conclude in FY 2019 with efforts resulting in improved engine design, energy hybridization for increased performance capabilities, and fuel efficiencies. These projects are expected to transition in FY 2020-2021. • FY 2017 OECIF projects support two main topics: Thermal and Power Management Technologies for High Pulse Power Systems; and Wireless Transmission of Energy in the Far-Field. These investments focus on the energy and power sub-systems that enable directed energy weapons as well as future warfighting concepts with unlimited power and communications. Efforts are demonstrating early success and pushing technology forward across wireless transmission in far-field, laser beaming, space solar, and photovoltaic testing. <p>Increased lethality of directed energy weapons is enabled by advanced power and thermal innovation in:</p> <ul style="list-style-type: none"> • Lab-based prototypes of thermal management systems to bolster mission-success of DEW systems; • Hybrid energy storage module units to enable continuous firing of pulse load capability and reduced logistics; and • Energy management systems for high power payloads that increase fuel savings as well as improve power and thermal transient capability. <p>Resiliency is bolstered by far field wireless energy development of:</p> <ul style="list-style-type: none"> • Alternative manufacturing methods for lightweight flexible high efficiency III-V solar cells that provide a breakthroughs in cost reduction as well as decreased production time for the next generation space solar concepts; • Alternative solar cell materials, such as perovskites that increase mobile power generation capability by a factor of three as well as decreasing weight and increasing efficiency; and • Mobile power meters for preventative maintenance and agile logistics. <p>Innovative operational concepts can be realized with new battlefield technologies including:</p> <ul style="list-style-type: none"> • Advances in novel space solar collection and wireless power beaming technologies which lead to increased energy resiliency and assured energy supply; • Studies on space solar on energy resupply capability that provide knowledge towards future investment strategies; • Laser light power beaming technologies including the receiver, transmitter and safety system that enable infinite persistence communications and ISR assets; 					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0604055D8Z / <i>Operational Energy Capability Improvement</i>	Project (Number/Name) 455 / <i>Operational Energy Capability Improvement</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<ul style="list-style-type: none"> • Millimeter wave power beaming technologies including rectenna and sterling engine prototypes to enable persistent operations; and • Free-space optical communication system that provides a highly directional, jam-resistant, secure communications via an energy stream. <p>Finally, business reform is driven by the development of an artificial intelligence portfolio analysis tool that will speed operational energy S&T developments and improve investment decisions.</p> <p>Innovative advances in power and thermal management as well as wireless transmission of energy underpin lethal warfighting capability and are expected to contribute to increased power generation and distribution capabilities, reduced energy supply line burdens, and new autonomous power paradigms. The breadth of applications include directed energy / electronic weaponry, persistent autonomous systems, power generation and distribution on the ground and in space, and advanced communication systems.</p> <ul style="list-style-type: none"> • FY 2018 OECIF projects are one-year studies to identify operational energy S&T gaps in the near-, mid-, and far-term. The studies will deliver community vetted, operational energy investment roadmaps. Once these projects are completed, they will be the pathway to feed the next operational energy strategy and they will inform the topic selection for FY 2020 OECIF proposals. • FY 2019 OECIF projects directly support "Enhanced Energy Storage to Improve Lethality and Warfighting Performance" consistent with the National Defense Strategy. Investments focus on standardization, safety, and advanced performance of energy storage solutions with consideration for business reform opportunities. <p>Business reform is driven by rapid demonstration of:</p> <ul style="list-style-type: none"> • The use of rapidly manufactured and field expendable logistics: surface/sub-surface vehicles for bulk fuel delivery; • Demonstration of innovative inverter technology for vehicle-to-grid energy storage and micro-gridding enabling technology for autonomous vehicle recharging; • Application of artificial intelligence and machine learning to demonstrate increased development speeds for rapid-recharge antiferroelectric capacitors; • Unique aerodynamic designs for on-board UAS energy fuel storage; • Hybrid power management and storage for Group 3 UAS; and • Mechanical demonstrations of in-flight energy storage for both platforms and weapon systems. <p>OECIF supports storage safety innovation in:</p>			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0604055D8Z / <i>Operational Energy Capability Improvement</i>	Project (Number/Name) 455 / <i>Operational Energy Capability Improvement</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<ul style="list-style-type: none"> • Novel aqueous battery chemistries that do not burn and have no fixed dependence on form factor, offering the warrior and platforms greater safety and flexibility; • Energy storage devices to support expeditionary basing requirements; and • Novel Li-Ion internal short detection system which senses at extremely low sensitivity levels allowing early warning to mitigate malfunctions or dangers. <p>Energy storage is also a key component of energy resiliency and FY 2019 OECIF investments support:</p> <ul style="list-style-type: none"> • Innovative hydrogen energy storage at bases; • Mobile power monitoring of energy storage and loads for preventative maintenance and agile logistics; • Integration of monolithically integrated, ultra-thin solar powered solid state lithium energy storage for space solar applications; and • Mechanical developments supporting flywheel storage technology. <p>Finally, FY 2019 OECIF emphasizes standardization with the potential to save the department millions of dollars including:</p> <ul style="list-style-type: none"> • Standardization of Li-Ion 6T drop-in replacement batteries; • Standardization of Li-Ion storage containers for world-wide shipping and development of a DoD-wide Li-Ion database; and • Standardization of high voltage energy storage module to support Directed Energy/Electronic Warfare. <p>Innovative advances in energy storage underpins lethal warfighting capability and the FY 2019 efforts are expected to significantly contribute to silent watch, greater and safer on-board power for payloads, increased unrefueled range and endurance, reduced energy supply line burdens, and the ability to support autonomous operations. The breadth of applications includes directed energy / electronic weaponry, the dismounted warfighters combat load, long range and endurance of autonomous systems, and storage of energy in and from space.</p> <p>The Services submitted a record \$175.000 million in prioritized proposal requests for energy storage types (batteries, fuel cells, ultra-capacitors, flywheels, compressed gases, thermal storage, betavoltaics, pumped hydro energy/power density, safety, standardization, hybridization, reliability, cyclic behavior, and efficiency). Concerted industry outreach efforts with the Defense Innovation Unit and Manufacturing Technology programs increase the likelihood of near-term transition.</p> <p>FY 2020 Plans:</p> <ul style="list-style-type: none"> • FY 2017 funding for OECIF programs, as mentioned above, will conclude and projects will transfer to their transition partners. • FY 2019 programs will continue with their technology development efforts, demonstrations, and deliverables. 			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense			Date: February 2019		
Appropriation/Budget Activity 0400 / 3		R-1 Program Element (Number/Name) PE 0604055D8Z / <i>Operational Energy Capability Improvement</i>		Project (Number/Name) 455 / <i>Operational Energy Capability Improvement</i>	
B. Accomplishments/Planned Programs (\$ in Millions)			FY 2018	FY 2019	FY 2020
<p>OUSD(R&E) emphasizes modernization to shape the future force. In FY 2020, OECIF projects are expected to emphasize space, weapons, and electronic warfare as emerging capabilities and will be shaped by FY 2018 Operational Energy S&T gaps and roadmaps. Near-peer competitors are overmatching DoD in power beaming and space solar technologies for battlefield advantage, necessitating a critical OECIF effort to address the shortfalls. Per the findings and recommendations of the recent DoD study "Opportunities and Challenges for Space Solar for Remote Installations," measured, comprehensive investments at the Advanced Technology Development (Budget Activity 3) level will be made in six focus areas:</p> <p>(1) Space Solar Collection – Low-cost, lightweight photovoltaics through revolutionary production methods are key to manufacturing at scale. Once produced, thermal, radiation, and space qualification testing is needed. FY 2020 investment level: \$7.200 million.</p> <p>(2) Power Beaming Transmission – High-efficiency, compact microwave/millimeter-wave/optical source integration with power transmitters is needed. High specific power transmitters, particularly in the short-wave infrared, will be built and tested. FY 2020 investment level: \$5.900 million.</p> <p>(3) Power Beaming Reception – Tactically deployable ground receivers for power beaming do not currently exist. Variable power density-compatible, portable, ruggedized, modular receivers will be developed and tested. FY 2020 investment level: \$6.100 million.</p> <p>(4) Receiver Power Distribution – Deployed microgrid and storage integration for power receiver usage is required for effective utilization. Operations scenarios for crewed and autonomous users will be formulated and hardware prototypes implemented. FY 2020 investment level: \$2.400 million.</p> <p>(5) Architecture Analytics – Campaign modeling and examination of the implications of different means of energy conversion and ground and space segment approaches will critically focus investments and drive Conops development. FY 2020 investment level: \$3.000 million.</p> <p>(6) Integrating Technologies – Leap ahead technologies in large area metrology, high-altitude receiver craft, thermal management, high voltage management, and airborne tether technologies are critical to ensuring integration of the final capability. FY 2020 investment level: \$5.400 million.</p> <p>These elements kick-off efforts for power beaming and space solar capabilities to increase warfighter lethality and reduce logistical burdens. For contexts of ground-to-ground, elevated, high-altitude, low earth orbit, and higher orbits, the progression of power beaming capabilities to include longer links and higher powers will provide a credible path to an operational capability. OECIF will continue engagement with OSD, Services, and CCMDs for validation of development strategies for FY 2021 and beyond.</p> <p><i>FY 2019 to FY 2020 Increase/Decrease Statement:</i></p>					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0604055D8Z / <i>Operational Energy Capability Improvement</i>	Project (Number/Name) 455 / <i>Operational Energy Capability Improvement</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
The \$30.000 million increase in OECIF funding for FY 2020 aims to help shape Service investment across six core functional areas within the operational energy domain: Space Solar Collection, Power Beaming Transmission, Power Beaming Reception, Receiver Power Distribution, Architecture Analytics, and Supporting Technologies. These areas are highlighted in the FY 2020 plan above.			
Accomplishments/Planned Programs Subtotals		37.288	40.478
		FY 2018	FY 2019
Congressional Add: Operational Energy Capability Improvement Program Increase		2.500	5.000
FY 2018 Accomplishments: The FY 2018 appropriation included a \$2.500 million program increase for the Operational Energy Capability Improvement program.			
FY 2019 Plans: The FY 2019 appropriation included a \$5.000 million program increase for the Operational Energy Capability Improvement program.			
Congressional Adds Subtotals		2.500	5.000
C. Other Program Funding Summary (\$ in Millions)			
N/A			
Remarks			
D. Acquisition Strategy			
N/A			
E. Performance Metrics			
Projects provide a detailed work schedule with technical objectives and tasks for the duration of funding. Monthly financial and quarterly technical meetings are held to ensure milestones, testing, and demonstrations are progressing. Twice a year the projects showcase their progress: once at an annual technology exchange; and again with the Office of the Secretary of Defense and Component/Service energy office. During the annual assessment with the energy office, each stated objective is evaluated and, based on the outcome, the project is given a go/no-go determination for continued funds.			

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity					R-1 Program Element (Number/Name)							
0400: Research, Development, Test & Evaluation, Defense-Wide / BA 3: Advanced Technology Development (ATD)					PE 0303310D8Z / CWMD Systems: Advanced Technology Development							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	192.168	32.111	26.583	28.907	-	28.907	28.632	28.583	28.413	28.696	Continuing	Continuing
004: Advanced Technology Demonstration	192.168	32.111	26.583	28.907	-	28.907	28.632	28.583	28.413	28.696	Continuing	Continuing

Note

Reduction from FY 2018 to FY2019 the result of reallocation of resources across the portfolio to better support the full RDT&E cycle and technology insertions. Increase from FY2019 to FY2020 the result of further reallocation of resources to gain efficiencies following the elimination of BA-6 / PE#0306310D8Z and combination of O&M projects CWMD Sustainment with Threat Reduction and Arms Control.

A. Mission Description and Budget Item Justification

The Countering Weapons of Mass Destruction (CWMD) Systems program provides funding for research, development, integration, and deployment of CWMD capabilities. Funding is allocated to a portfolio of projects and activities in response to Combatant Command, joint, and Military Service capability needs and research initiatives. The CWMD Systems program supports 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 program is organized to develop, enhance, mature and transition technologies across the RDT&E continuum, from Advanced Technology Development through Operational Systems Development, as well as limited sustainment in unique cases. A focus area is investment in CWMD-related technologies that require additional development to transition to fielded capabilities, in response to validated, prioritized requirements. This effort fills a seam in which capability gaps are not being addressed adequately or sufficiently to meet warfighter needs. The CWMD Systems program closes gaps identified by specialized military units and leverages prior S&T investments to continue development and fielding of operational systems to those units.

The program's legacy focus on CWMD situational awareness capabilities remains a significant component of the investment portfolio. U.S. Special Operations Command, which assumed CWMD mission responsibilities in January 2017 per the Unified Command Plan, is providing focus and guidance for development of CWMD situational awareness capabilities. The CWMD Systems program funds initiatives to close CWMD situational awareness gaps by leveraging mature technologies, modifying existing systems, and utilizing technology-enabled analytical cells to provide support to Combatant Commands and other joint and Service commands. These cells curate, synthesize, and contextualize CWMD information for end-users. This hybrid approach facilitates cross-organizational information sharing and collaboration, necessary for addressing the trans regional character of WMD proliferation.

During FY 2018 and FY 2019 the CWMD Systems program utilized four Research, Development, Test & Evaluation (RDT&E) program elements (BA-3 / PE#0303310D8Z, BA-5 / PE#0305310D8Z, BA-6 / PE#0306310D8Z, and BA-7 / PE#0607310D8Z), as well as an Operations and Maintenance (O&M) "CWMD Sustainment" line (PE#0901388D8Z ORC-2531). Reallocation of resources beginning in FY 2020 will eliminate the BA-6 / PE#0306310D8Z program element and address O&M requirements with the "Threat Reduction and Arms Control" line (PE#0901388D8Z ORC-3501).

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide / BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0303310D8Z / <i>CWMD Systems: Advanced Technology Development</i>
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This Program Element (PE) funds research, development, testing, and evaluation of materiel and non-materiel solutions to develop CWMD capabilities. Funds are used for development and integration of hardware or software technologies; contractor personnel for analytic cells at defense agencies and under Combatant Commands; research partnerships with DoD and civilian academic institutions, FFRDCs and UARCs; and interagency table-top exercises conducted on behalf of Combatant Commands.

This appropriation funds travel to support the requirements of this program, and 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, development and test and evaluation efforts.

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	33.382	26.644	25.452	-	25.452
Current President's Budget	32.111	26.583	28.907	-	28.907
Total Adjustments	-1.271	-0.061	3.455	-	3.455
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-1.207	-			
• FFRDC Reduction	-0.064	-0.061			
• Reallocation from other CWMD Systems	-	-	4.539	-	4.539
PE's					
• Economic adjustment	-	-	-1.084	-	-1.084

Change Summary Explanation

Reduction from FY 2018 to FY2019 the result of reallocation of resources across the portfolio to better support the full RDT&E cycle and technology insertions. Increase from FY2019 to FY2020 the result of further reallocation of resources to gain efficiencies following the elimination of BA-6 / PE#0306310D8Z and combination of O&M projects CWMD Sustainment with Threat Reduction and Arms Control.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 3					R-1 Program Element (Number/Name) PE 0303310D8Z / CWMD Systems: Advanced Technology Development				Project (Number/Name) 004 / Advanced Technology Demonstration			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
004: Advanced Technology Demonstration	192.168	32.111	26.583	28.907	-	28.907	28.632	28.583	28.413	28.696	Continuing	Continuing

A. Mission Description and Budget Item Justification

The Countering Weapons of Mass Destruction (CWMD) Systems program provides funding for research, development, integration, and deployment of CWMD capabilities. Funding is allocated to a portfolio of projects and activities in response to Combatant Command, joint, and Military Service capability needs and research initiatives.

The CWMD Systems program is organized to develop, enhance, mature and transition technologies across the RDT&E continuum, from Advanced Technology Development through Operational Systems Development, as well as limited sustainment in unique cases. A focus area is investment in CWMD-related technologies that require additional development to transition to fielded capabilities, in response to validated, prioritized requirements. This effort fills a seam in which capability gaps are not being addressed adequately or sufficiently to meet warfighter needs. The CWMD Systems program closes gaps identified by specialized military units and leverages prior S&T investments to continue development and fielding of operational systems to those units.

The program's legacy focus on CWMD situational awareness capabilities remains a significant component of the investment portfolio. U.S. Special Operations Command, which assumed CWMD mission responsibilities in January 2017 per the Unified Command Plan, is providing focus and guidance for development of CWMD situational awareness capabilities. The CWMD Systems program funds initiatives to close CWMD situational awareness gaps by leveraging mature technologies, modifying existing systems, and utilizing technology-enabled analytical cells to provide support to Combatant Commands and other joint and Service commands. These cells curate, synthesize, and contextualize CWMD information for end-users. This hybrid approach facilitates cross-organizational information sharing and collaboration, necessary for addressing the trans regional character of WMD proliferation.

During FY 2018 and FY 2019 the CWMD Systems program utilized four Research, Development, Test & Evaluation (RDT&E) program elements (BA-3 / PE#0303310D8Z, BA-5 / PE#0305310D8Z, BA-6 / PE#0306310D8Z, and BA-7 / PE#0607310D8Z), as well as an Operations and Maintenance (O&M) "CWMD Sustainment" line (PE#0901388D8Z ORC-2531). Reallocation of resources beginning in FY 2020 will eliminate the BA-6 / PE#0306310D8Z program element and address O&M requirements with the "Threat Reduction and Arms Control" line (PE#0901388D8Z ORC-3501).

This Program Element (PE) funds research, development, testing, and evaluation of materiel and non-materiel solutions to develop CWMD capabilities. Funds are used for development and integration of hardware or software technologies; contractor personnel for analytic cells at defense agencies and under Combatant Commands; research partnerships with DoD and civilian academic institutions, FFRDCs and UARCs; and interagency table-top exercises conducted on behalf of Combatant Commands.

This appropriation funds travel to support the requirements of this program, and 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, development and test and evaluation efforts.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0303310D8Z / CWMD Systems: <i>Advanced Technology Development</i>	Project (Number/Name) 004 / <i>Advanced Technology Demonstration</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
Title: Advanced Technology Demonstration Description: Research, develop, test, and evaluate materiel and non-materiel solutions to develop CWMD capabilities. Funds are used for development and integration of hardware or software technologies; contractor personnel for fusion cells at DTRA and DIA; research partnerships with DoD and civilian academic institutions, FFRDCs and UARCs; and interagency table-top exercises conducted on behalf of Combatant Commands. FY 2019 Plans: <ul style="list-style-type: none"> • Continue/complete development, integration, and/or modification of technologies, systems, and/or applications to meet CWMD capability needs of Combatant Commands and specialized military units, building upon projects initiated in FY2017 and FY2018 • Continue analytic cells at defense agencies and under Combatant Commands • Continue support to USSOCOM for development and fielding of DoD CWMD "User Defined Operational Picture," including use of DIA and DTRA analytical cells • Conduct table-top exercises and senior leader seminars in support of U.S. Special Operations Command or other Combatant Commands • Continue CWMD-related research studies and analyses FY 2020 Plans: <ul style="list-style-type: none"> • Continue/complete development, integration, and/or modification of technologies, systems, and/or applications to meet CWMD capability needs of Combatant Commands and specialized military units, building upon projects initiated in FY2018 and FY2019 • Continue analytic cells at defense agencies and under Combatant Commands • Continue CWMD-related research studies and analyses FY 2019 to FY 2020 Increase/Decrease Statement: Increase from FY2019 to FY2020 the result of reallocation of resources to gain efficiencies following the elimination of BA-6 / PE#0306310D8Z and combination of O&M projects CWMD Sustainment with Threat Reduction and Arms Control.		32.111	26.583
Accomplishments/Planned Programs Subtotals		32.111	28.907
C. Other Program Funding Summary (\$ in Millions) N/A			
Remarks			
D. Acquisition Strategy Develop, reuse, or enhance information technologies to field initial capabilities to end-users. As technologies mature and user needs are refined, systems or applications may transition to acquisition program(s) or be sustained separately. Integration of or interoperability among systems is also an acquisition pathway.			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0303310D8Z / CWMD Systems: <i>Advanced Technology Development</i>	Project (Number/Name) 004 / <i>Advanced Technology Demonstration</i>

E. Performance Metrics

Success in this area is measured by compliance with various statutes and DoD directives that govern the conduct of the affairs within the Office of the Assistant Secretary of Defense for Nuclear, Chemical and Biological Defense Programs (OASD/NCB). Maintain cost, schedule, and performance reporting, review, and adjudication. Maintain requirements traceability matrix.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>					R-1 Program Element (Number/Name) PE 0603161D8Z I <i>Nuclear and Conventional Physical Security/Countering Nuclear Threats</i>							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	237.297	32.165	28.076	42.695	-	42.695	44.047	43.235	43.219	43.130	Continuing	Continuing
162: <i>Nuclear and Conventional Physical Security</i>	197.555	30.587	27.301	35.134	-	35.134	35.050	32.706	33.557	33.893	Continuing	Continuing
041: <i>CNT Prevention ADC&P</i>	1.927	0.000	0.550	5.836	-	5.836	7.272	7.804	7.937	8.010	Continuing	Continuing
040: <i>National Technical Nuclear Forensics Systems</i>	37.815	1.578	0.225	1.725	-	1.725	1.725	2.725	1.725	1.227	Continuing	Continuing

Note

The FY2019 funding request was reduced by \$7.720 million to account for the availability of prior year execution balances, with payback in FY20 & FY21.

A. Mission Description and Budget Item Justification

This Program Element (PE) addresses the need to defend and deter against weapons of mass destruction (WMD) 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 throughout DoD for an integrated and systemic RDT&E approach for countering nuclear threats and nuclear and conventional physical security technology and systems. The funding has been centralized in this Defense-wide PE since the early 1990s and represents a substantial portion of all DoD physical security RDT&E funding. Priorities for this PE RDT&E efforts are driven by inputs from Quadrennial Defense Review guidance, Combatant Command and Service requirements, analysis reports such as "Protecting the Force: Lessons from Fort Hood," January 2010, the Integrated Unit, Base, and Installation Protection Cost Benefits Analysis, Multi-national Work Plans established through the Nuclear Security Summit process, and DoD Directive 5210.41, Security Policy for Protecting Nuclear Weapons-directed requirements and associated security deviation reports.

Under this integrated approach, funds are used to provide advanced component development and prototypes for the Department in 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. This program will evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment. The projects under the Program Element either (a) lead to Programs of Record which can transition to Program Element 0604161D8Z for systems development and demonstration (SDD); (b) become technology insertions into existing programs; or (c) advance to being a certified Commercial/Government off-the-shelf product. The PE initiatives are coordinated by the Physical Security Enterprise and Analysis Group. This group is responsible for avoiding duplication of effort and when applicable ensure systems integration and promote interoperability and sustainability.

This PE 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),

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0603161D8Z I <i>Nuclear and Conventional Physical Security/Countering Nuclear Threats</i>
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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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	32.937	28.140	44.296	-	44.296
Current President's Budget	32.165	28.076	42.695	-	42.695
Total Adjustments	-0.772	-0.064	-1.601	-	-1.601
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.709	-			
• FFRDC	-0.063	-0.064	-	-	-
• INV-D-032 CDBP Bio Chem Threats Preparedness Reduction	-	-	-1.601	-	-1.601

Change Summary Explanation

FY 2019 Funds rephase from FY19 to FY20 and FY21 to aid in increasing program execution rates closer to the DoD benchmarks.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 4					R-1 Program Element (Number/Name) PE 0603161D8Z / Nuclear and Conventional Physical Security/Countering Nuclear Threats				Project (Number/Name) 162 / Nuclear and Conventional Physical Security			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
162: Nuclear and Conventional Physical Security	197.555	30.587	27.301	35.134	-	35.134	35.050	32.706	33.557	33.893	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Program Element (PE) addresses the need to defend and deter against weapons of mass destruction (WMD) 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 throughout DoD for an integrated and systemic RDT&E approach for countering nuclear threats and nuclear and conventional physical security equipment (PSE) technology and systems. The funding has been centralized in this Defense-wide PE since the early 1990s and represents a substantial portion of all DoD PSE RDT&E funding. Priorities for this PE RDT&E efforts are driven by inputs from Quadrennial Defense Review guidance, Combatant Command and Service requirements, analysis reports such as "Protecting the Force: Lessons from Fort Hood," January 2010, the Integrated Unit, Base, and Installation Protection Cost Benefits Analysis, Multi-national Work Plans established through the Nuclear Security Summit process, and DoD Directive 5210.41, Security Policy for Protecting Nuclear Weapons-directed requirements and associated security deviation reports.

Under this integrated approach, funds are used to provide PSE advanced component development and prototypes for the Department in 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 projects under the Program Element either (a) lead to Programs of Record – which can transition to Program Element 0604161D8Z for systems development and demonstration (SDD); (b) become technology insertions into existing programs; or (c) advance to being a certified Commercial/Government off-the-shelf product. The PE initiatives are coordinated by the Security Policy Verification Committee and the Physical Security Equipment Action Group. These groups work together to avoid duplication of effort and when applicable ensure systems integration and promote interoperability and sustainability.

This PE 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), 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. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
Title: Detection and Assessment	17.628	15.775	20.303

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0603161D8Z / Nuclear and Conventional Physical Security/Countering Nuclear Threats	Project (Number/Name) 162 / Nuclear and Conventional Physical Security		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<p>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.</p> <p>FY 2019 Plans:</p> <ul style="list-style-type: none">• Continue to develop a Joint detection and assessment capability• Continue to develop a multi-sensor detection and discrimination capability to reduce nuisance and false alarms• Continue to develop a radar processing dynamic structure filter to reduce nuisance and false alarms• Develop a Portable Intrusion Detection System <p>FY 2020 Plans:</p> <ul style="list-style-type: none">• Continue Trace Explosive Detection System Improvements• Continue evaluation of Colorimetric kits on bulk explosives and materials to evaluate the potential trace detection capabilities• Continue Linear Sensor System Development for Maritime Threats• Continue efforts on Joint Active Shooter Protection and Response• Conduct an independent cyber assessment of the Sonardyne Sentinel Sonar sub-system for the Mk 6 Mod 3 Marine Mammal System to determine system vulnerabilities in order to fortify the physical security of USPACOM's distributed basing strategy. <p>FY 2019 to FY 2020 Increase/Decrease Statement: Projects and project costs vary from year to year</p>				
<p>Title: Access Controls</p> <p>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.</p> <p>FY 2019 Plans:</p> <ul style="list-style-type: none">• Complete development of an access control capability to compare DoD registered cardholders against the Terrorist Screening Database <p>FY 2020 Plans:</p> <ul style="list-style-type: none">• Continue system improvement on the Identity Matching Engine for Security & Analysis to enhance the matching engine to compare cardholders against the Terrorist Screening Database. <p>FY 2019 to FY 2020 Increase/Decrease Statement:</p>		5.488	4.912	6.321

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0603161D8Z / Nuclear and Conventional Physical Security/Countering Nuclear Threats	Project (Number/Name) 162 / Nuclear and Conventional Physical Security		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
Projects and project costs vary from year to year				
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. FY 2019 Plans: • Develop an advanced thermal imaging sight for the M2HB/M2A1 crew-served weapon systems. This system will enable improved target acquisition capabilities and will include multiple target indicators, an integrated ballistics processor, and video recording and export functionality. • Integrate Man-portable Tactical Autonomous System Unmanned Surface Vehicle controls into the Near-shore Unified Tactical Response capability FY 2020 Plans: • Continue to develop the Gunnar Waterside Security system, using operational augmented reality Heads Up Display will allow for effective visual communication between the waterside security officer and the security personnel manning defensive gun positions. • Continue design improvements and demonstrate a field-able stabilized crew-served heavy machine gun for naval applications. FY 2019 to FY 2020 Increase/Decrease Statement: Projects and project costs vary from year to year		0.392	0.351	0.451
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. FY 2019 Plans: No efforts currently planned. FY 2020 Plans: No efforts currently planned.		0.000	0.000	0.000
Title: Prevention		2.532	2.266	2.916

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0603161D8Z / Nuclear and Conventional Physical Security/Countering Nuclear Threats	Project (Number/Name) 162 / Nuclear and Conventional Physical Security		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<p>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.</p> <p>FY 2019 Plans:</p> <ul style="list-style-type: none">• Conduct a cyber security assessment of electronic security systems and develop a repeatable process to verify/validate other electronic security systems in the future <p>FY 2020 Plans:</p> <ul style="list-style-type: none">• Develop a mobile platform for network data capture and analysis that gives the ability to perform network security monitoring on various customer networks. <p>FY 2019 to FY 2020 Increase/Decrease Statement: Projects and project costs vary from year to year</p>				
<p>Title: Decision Support Systems</p> <p>Description: Decision support systems serve the management, operations, and planning levels of the DoD physical security enterprise to help to make decisions, which may be rapidly changing and not easily specified in advance. This capability area will focus on command and control equipment and projects related to the creation and enhancement of common operating pictures, and the establishment of common architectures / interface standards.</p> <p>FY 2019 Plans:</p> <ul style="list-style-type: none">• Provide a persistent identification capability using a secure communication system for responding forces that will represent a “leap ahead” from currently deployed systems• Develop a full Cross Domain Solution that allows unclassified sensors to inter-operate with classified force protection command and control systems• Develop a counter unmanned underwater, surface and ground vehicle Investment Guides <p>FY 2020 Plans:</p> <ul style="list-style-type: none">• Continue development of a full Cross Domain Solution that allows unclassified sensors to inter-operate with classified force protection command and control systems <p>FY 2019 to FY 2020 Increase/Decrease Statement: Projects and project costs vary from year to year</p>		3.084	2.760	3.551
<p>Title: Analytical Support</p>		1.463	1.237	1.592

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0603161D8Z / <i>Nuclear and Conventional Physical Security/Countering Nuclear Threats</i>	Project (Number/Name) 162 / <i>Nuclear and Conventional Physical Security</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>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 Equipment/Countering Nuclear Threats RDT&E Program.</p> <p>FY 2019 Plans:</p> <ul style="list-style-type: none"> Evaluate, select and integrate three Video Analytics capabilities that reduces operator workloads and allows inexpensive camera's to become detection sensors <p>FY 2020 Plans:</p> <ul style="list-style-type: none"> Establish a nuclear deterrence model, with analysis results will support the Nuclear Weapons Council strategic planning to include modernization strategies and stockpile composition assessments and investment tradeoff. <p>FY 2019 to FY 2020 Increase/Decrease Statement: Projects and project costs vary from year to year</p>			
Accomplishments/Planned Programs Subtotals		30.587	27.301
C. Other Program Funding Summary (\$ in Millions)			
N/A			
Remarks			
D. Acquisition Strategy			
N/A			
E. Performance Metrics			
The program performance metrics are established/approved through the DoD Physical Security Enterprise and Analysis Group (PSEAG). The cost, schedule and technical progress is reviewed at quarterly PSEAG meetings. Performance variances are addressed and corrective action(s) is(are) implemented as necessary.			

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense												Date: February 2019			
Appropriation/Budget Activity 0400 / 4						R-1 Program Element (Number/Name) PE 0603161D8Z / Nuclear and Conventional Physical Security/Countering Nuclear Threats				Project (Number/Name) 162 / Nuclear and Conventional Physical Security					
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Prior Years - Closed Out Efforts	Various	Various : Various	128.244	-		-		-		-		-	Continuing	Continuing	-
Defense Security Enterprise Architecture	Various	Multiple performers : Multiple locations	5.444	-		-		-		-		-	-	-	-
Keystone EUCOM Project	Various	Multiple Performers : Multiple Locations	5.876	-		-		-		-		-	-	-	-
Joint Risk Decision Support Tool	MIPR	AF Civil Engineering Center : Tyndall AFB, FL	5.395	-		-		-		-		-	-	-	-
Foliage Penetrating Technology Evaluation	MIPR	Naval Surface Warfare Crane : Crane, Indiana	0.504	-		-		-		-		-	-	-	-
Detection & Assessment Follow-on	Various	Multiple Vendors : Multiple Locations	5.554	-		-		-		-		-	-	-	-
Maritime Expeditionary & Transit Security	MIPR	ARO : Research Triangle Park, NC	3.470	-		-		-		-		-	-	-	-
US Navy Spike Weapon System, Common Launch Tube	MIPR	NAVAIRWARCENWPNDIV : China Lake, CA	3.539	-		-		-		-		-	-	-	-
Thermal Imaging Dual-use for Aerosol Monitoring Alarms and Security	MIPR	ECBC : Aberdeen Proving Ground	4.166	-		-		-		-		-	-	-	-
Multi-sensor Detection and Discrimination	MIPR	Naval Research Laboratory : Washington, DC	2.113	-		-		-		-		-	-	-	-
Tactical Security System	MIPR	Multiple Performers : Multiple Locations	2.350	-		1.995		1.150		-		1.150	-	-	-
Mobile Integrated Expeditionary Vehicle Inspection Station	MIPR	US Army ARDEC : Picatinny Arsenal, NJ	2.100	1.150		-		-		-		-	-	-	-
Linear Sensor System for Multi-Threat Detection	MIPR	Engineer Research and Development	1.250	1.200		1.320		-		-		-	-	-	-

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense												Date: February 2019			
Appropriation/Budget Activity 0400 / 4						R-1 Program Element (Number/Name) PE 0603161D8Z / Nuclear and Conventional Physical Security/Countering Nuclear Threats				Project (Number/Name) 162 / Nuclear and Conventional Physical Security					
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
		Center : Vicksburgs, MS													
Portable Intrusion Detection System	MIPR	AFLCMC : Hanscom AFB, MA	1.100	1.862		1.500		1.500		-		1.500	-	-	-
JIGSAW Enhanced Capability Suite Technology Development	MIPR	SPAWAR Atl : Charleston, SC	0.800	-		-		-		-		-	-	-	-
GreyNet - Secure Communications with Persistent Identification/ Blue Force Tracking	MIPR	SPAWAR Atlantic : Charleston, SC	1.450	1.762		-		-		-		-	-	-	-
Wide Area Detection Systems	MIPR	AFLCMC : Hanscom AFB, MA	0.800	-		-		-		-		-	-	-	-
Radar Detection of UAVs	MIPR	SPAWAR Atlantic : Charleston, SC	0.700	-		-		-		-		-	-	-	-
HVU Self Escort M&S	MIPR	Navy - Strategic System Programs : Washington Navy Yard, DC	0.275	-		-		-		-		-	-	-	-
Force Protection Pre-shot Sniper Detection Capability	TBD	Multiple Performers : Multiple Locations	-	1.464		-		-		-		-	-	-	-
Harbor and Restricted Waterway Counter-UUV/ AUV System	MIPR	NUWC NWPT : Newport, RI	-	0.445		-		-		-		-	-	-	-
WISP 2.0	TBD	TBD : TBD	-	1.616		1.000		-		-		-	-	-	-
Defense Installation Access Control	TBD	TBD : TBD	0.345	1.853		2.000		5.200		-		5.200	Continuing	Continuing	-
Gatekeeper on the Move - Biometrics	TBD	TBD : TBD	-	0.900		-		-		-		-	-	-	-
Counter Personal Water Craft - Naval Experiment	MIPR	NSWC Dahlgren : Dahlgren, VA	0.561	-		-		-		-		-	-	-	-

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense												Date: February 2019			
Appropriation/Budget Activity 0400 / 4						R-1 Program Element (Number/Name) PE 0603161D8Z / <i>Nuclear and Conventional Physical Security/Countering Nuclear Threats</i>						Project (Number/Name) 162 / <i>Nuclear and Conventional Physical Security</i>			

Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Physical Security Enterprise Program	Various	Multiple Performers : Multiple Locations	9.081	0.569		0.542		3.024		-		3.024	Continuing	Continuing	-
Defense Security CBRN Information Sharing	Various	ARDEC : Picatinny Arsenal, NJ	0.845	0.078		-		-		-		-	-	-	-
Force Protection Cross Domain	MIPR	Multiple Performers : Multiple Locations	-	1.408		1.400		-		-		-	-	-	-
Force Protection Workload Reduction via Video Analytics	MIPR	Multiple Performers : Multiple Locations	-	1.047		1.496		1.700		-		1.700	Continuing	Continuing	-
Joint Active Shooter Protection and Response	MIPR	ARDEC : Picatinny Arsenal, NJ	-	0.723		1.583		-		-		-	-	-	-
Enhancing Biosecurity Surveillance using RFI Technology	MIPR	US Army Medical Research Institute of Infectious Diseases : Fort Detrick, MD	-	0.287		0.559		0.473		-		0.473	-	-	-
Enhanced Access Control for Husbanding Agencies using Biometrics	MIPR	Naval Surface Warfare Center, Dahlgren Division : Dahlgren, VA	-	0.952		0.375		0.849		-		0.849	-	-	-
M2HB/M2A1	MIPR	Naval Surface Warfare Center, Crane Division : Crane, IN	-	0.400		0.750		-		-		-	-	-	-
GunnAR for Waterside Security	MIPR	SPAWARSYSCEN Pacific : San Diego, CA	-	0.700		0.300		0.300		-		0.300	-	-	-
Tactical Radio Interface Console	MIPR	SPAWARSYSCEN Pacific : San Diego, CA	-	0.225		-		-		-		-	-	-	-
Guardian Angel	MIPR	SPAWARSYSCEN : Charleston, SC	-	0.009		-		-		-		-	-	-	-

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0603161D8Z / <i>Nuclear and Conventional Physical Security/Countering Nuclear Threats</i>	Project (Number/Name) 162 / <i>Nuclear and Conventional Physical Security</i>
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Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Info Ops/Computer Network Defense and Exploitation Toolset	MIPR	DTRA : Ft. Belvoir, VA	-	-		-		1.700		-		1.700	Continuing	Continuing	-
Virtual Reality Synthetic Boat and Warning Shot Simulator	MIPR	Multiple Performers : Multiple Locations	-	0.416		0.423		-		-		-	-	-	-
Surface Enhanced Raman Spectroscopy for Post-Blast	MIPR	NSWC IHEODTD : Indian Head, MD	-	-		-		0.802		-		0.802	Continuing	Continuing	-
Entry Control Point Optimization	MIPR	Multi Performers : Multiple Locations	-	-		-		0.250		-		0.250	Continuing	Continuing	-
Automated Alarm Assessment	MIPR	Multiple Performers : Multiple Locations	-	-		1.000		1.000		-		1.000	Continuing	Continuing	-
Secure Tactical Communications Module	MIPR	Multiple Performers : Multiple Locations	-	-		0.826		0.659		-		0.659	Continuing	Continuing	-
Flexible Fire Control System	MIPR	Multiple Performers : Multiple Locations	-	-		0.934		1.800		-		1.800	Continuing	Continuing	-
Automated Unmanned Ground Vehicle for Patrol & Security	MIPR	Multiple Performers : Multiple Locations	-	-		-		0.600		-		0.600	Continuing	Continuing	-
Alert Attack Resistant Container	MIPR	Naval Facilities Engineering and Expeditionary Warfare Center : Port Hueneme, CA	-	0.119		1.000		1.500		-		1.500	Continuing	Continuing	-
Stabilized Crew-Served Heavy Machine Gun Mount	MIPR	NSWC : Crane, IN	-	-		-		0.614		-		0.614	Continuing	Continuing	-
Subtotal			185.962	19.185		19.003		23.121		-		23.121	Continuing	Continuing	N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense												Date: February 2019			
Appropriation/Budget Activity 0400 / 4						R-1 Program Element (Number/Name) PE 0603161D8Z / Nuclear and Conventional Physical Security/Countering Nuclear Threats				Project (Number/Name) 162 / Nuclear and Conventional Physical Security					
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Prior Years Completed Efforts	Various	Various Performers : Various Locations	0.800	-		-		-		-		-	-	-	-
World Institute for Nuclear Security	MIPR	Defense Threat Reduction Agency : Ft Belvoir, VA	1.350	-		-		-		-		-	-	-	-
Nuclear Security Subject Matter Experts	MIPR	Applied Research Laboratories, The University of Texas : Austin, Texas	0.820	0.325		0.225		0.225		-		0.225	Continuing	Continuing	-
Autonomous Defense Accelerator	MIPR	Army Research Lab : Adelphi, MD	-	0.200		-		-		-		-	-	-	-
PSEAG Support	MIPR	Army Research Lab : Adelphi, MD	-	0.536		0.600		0.645		-		0.645	Continuing	Continuing	-
Contingency Response Tool	SS/FFP	Cubic Global Defense : San Diego, CA	-	0.886		-		-		-		-	-	-	-
PSEAG Website and PSEAG SharePoint	MIPR	Army Research Lab : Adelphi, MD	0.266	0.264		0.395		0.308		-		0.308	Continuing	Continuing	-
Nuclear Matters Analytical Cell for Nuclear Deterrence	IA	DOE/Sandia National Laboratory : Albuquerque, NM	-	1.500		1.500		2.500		-		2.500	Continuing	Continuing	-
Nuclear Matters SIRC/ NDERG Support	Option/ T&M	SAIC : McLean, VA	-	0.700		1.500		1.500		-		1.500	Continuing	Continuing	-
Nuclear Matters Support	C/FFP	E3 Federal Solutions : Washington, DC	-	0.053		0.086		0.100		-		0.100	Continuing	Continuing	-
Nuclear Matters Technical Support	IA	Department of Health and Human Services : Bethesda, MD	-	0.107		1.826		1.826		-		1.826	Continuing	Continuing	-
Subtotal			3.236	4.571		6.132		7.104		-		7.104	Continuing	Continuing	N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense												Date: February 2019			
Appropriation/Budget Activity 0400 / 4						R-1 Program Element (Number/Name) PE 0603161D8Z / Nuclear and Conventional Physical Security/Countering Nuclear Threats						Project (Number/Name) 162 / Nuclear and Conventional Physical Security			
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Remarks NA															
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Citadel Protect	Various	Various : Various	0.140	-		-		-		-		-	-	-	-
Development, Test and Evaluation of System Operations Audit and Recording	MIPR	SPAWAR : Charleston, SC	-	0.591		-		-		-		-	-	-	-
Comparative Evaluation of Man-Portable Mass Spectrometry Explosive Detection Systems T&E	MIPR	NAVEODTECH : Indian Head, MD	0.918	-		-		-		-		-	-	-	-
Comparative Colorimetric T&E	MIPR	NAVEODTECH : Indian Head, MD	0.978	0.172		-		-		-		-	-	-	-
Aerial Physical Security Assessment	MIPR	SPAWARSYSCEN Atlantic : Charleston, SC	-	0.595		0.433		-		-		-	Continuing	Continuing	-
Joint Assessment of Nefarious Swimmer System	MIPR	Multiple Performers : Multiple Locations	-	0.975		1.267		-		-		-	Continuing	Continuing	-
Greyscan T&E	MIPR	NSWC IHEODTD : Indian Head, MD	-	-		0.371		-		-		-	-	-	-
Portable and Handheld X-ray T&E	MIPR	NSWC IHEODTD : Indian Head, MD	-	-		-		0.633		-		0.633	Continuing	Continuing	-
C-UAS in the Homeland	MIPR	Multiple Performers : Various Locations	-	4.247		-		3.500		-		3.500	Continuing	Continuing	-

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense												Date: February 2019			
Appropriation/Budget Activity 0400 / 4						R-1 Program Element (Number/Name) PE 0603161D8Z I Nuclear and Conventional Physical Security/Countering Nuclear Threats					Project (Number/Name) 162 I Nuclear and Conventional Physical Security				
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Test & Evaluation	MIPR	Army Research Laboratory : Adelphi, MD	-	-		-		0.561		-		0.561	Continuing	Continuing	-
Subtotal			2.036	6.580		2.071		4.694		-		4.694	Continuing	Continuing	N/A
Remarks NA															
Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Prior Years - Completed Efforts	Various	*** PERFORMING ACTIVITY *** : *** LOCATION ***	2.636	-		-		-		-		-	Continuing	Continuing	-
Detection & Assessment IPT	MIPR	AF Security Forces Center : Lackland AFB, TX	1.150	0.251		0.095		0.215		-		0.215	-	-	-
Explosive Detection Equipment Guide	MIPR	NAVEODTECH : Indian Head, MD	2.535	-		-		-		-		-	-	-	-
Subtotal			6.321	0.251		0.095		0.215		-		0.215	Continuing	Continuing	N/A
Remarks NA															
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			197.555	30.587		27.301		35.134		-		35.134	Continuing	Continuing	N/A
Remarks NA															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0603161D8Z / <i>Nuclear and Conventional Physical Security/Countering Nuclear Threats</i>	Project (Number/Name) 162 / <i>Nuclear and Conventional Physical Security</i>



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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Office of the Secretary Of Defense			Date: February 2019
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0603161D8Z / <i>Nuclear and Conventional Physical Security/Countering Nuclear Threats</i>	Project (Number/Name) 162 / <i>Nuclear and Conventional Physical Security</i>	

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>Detection & Assessment</i>				
Detection & Assessment	1	2012	4	2024
<i>Decision Support</i>				
Decision Support	1	2012	4	2024
<i>Storage & Safeguards</i>				
Storage & Safeguards	1	2012	4	2024
<i>Installation & Transport Security</i>				
Installation & Transport Security	1	2012	4	2024
<i>Prevention</i>				
Prevention	1	2012	4	2024
<i>Access Control</i>				
Access Control	1	2012	4	2024
<i>Analytical Support</i>				
Analytical Support	1	2012	4	2024

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 4					R-1 Program Element (Number/Name) PE 0603161D8Z / <i>Nuclear and Conventional Physical Security/Countering Nuclear Threats</i>				Project (Number/Name) 041 / <i>CNT Prevention ADC&P</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
041: <i>CNT Prevention ADC&P</i>	1.927	0.000	0.550	5.836	-	5.836	7.272	7.804	7.937	8.010	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		
A. Mission Description and Budget Item Justification <p>Establish a Defense-wide Nuclear Threat Reduction (NTR) Materiel Development Program focused on transitioning maturing technology development into operational capabilities that addresses gaps identified by Services, Combatant Commands, and Joint Staff. The CNT acquisition strategy directly applies to Joint requirements for CNT materiel development and addresses the materiel and sustainment gaps for general purpose Joint Forces including the US Army 20th CBRNECommand / Navy Visit, Board, Search, and Seizure / Technical Support Groups (NIMBLE ELDER and the US Special Operations Command).</p>												
B. Accomplishments/Planned Programs (\$ in Millions)									FY 2018	FY 2019	FY 2020	
Title: Countering Nuclear Threats Description: Establish a Defense-wide Countering Nuclear Threats (CNT) Materiel Development Program based on capability gaps identified by Services, Combatant Commands, and Joint Staff. The CNT acquisition strategy directly applies to Joint requirements for CNT materiel development and addresses the materiel and sustainment gaps for general purpose Joint Forces including the US Army 20th Support Command / Navy Visit, Board, Search, and Seizure / Technical Support Groups (NIMBLE ELDER and the US Special Operations Command). FY 2019 Plans: <ul style="list-style-type: none"> • Development of active prevention capabilities for nuclear threat reduction through developing improved DoD capabilities for early warning and detection of nuclear proliferation and building partner capacity to detect, interdict and disrupt proliferation networks. FY 2020 Plans: <ul style="list-style-type: none"> • Development of active prevention capabilities for nuclear threat reduction through developing improved DoD capabilities for early warning and detection of nuclear proliferation and building partner capacity to detect, interdict and disrupt proliferation networks. FY 2019 to FY 2020 Increase/Decrease Statement: Projects and project costs vary from year to year									0.000	0.550	5.836	
Accomplishments/Planned Programs Subtotals									0.000	0.550	5.836	
C. Other Program Funding Summary (\$ in Millions) N/A												

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0603161D8Z / <i>Nuclear and Conventional Physical Security/Countering Nuclear Threats</i>	Project (Number/Name) 041 / <i>CNT Prevention ADC&P</i>
C. Other Program Funding Summary (\$ in Millions) Remarks D. Acquisition Strategy N/A E. Performance Metrics The program performance metrics are established/approved through the Program Manager. The cost, schedule and technical progress is reviewed on a quarterly basis. Performance variances are addressed and corrective action(s) is(are) implemented as necessary.		

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0603161D8Z / <i>Nuclear and Conventional Physical Security/Countering Nuclear Threats</i>	Project (Number/Name) 041 / <i>CNT Prevention ADC&P</i>
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Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Radioisotope Identification Device	MIPR	JPEO CBD : Aberdeen, MD.	-	-		0.550		-		-		-	-	-	-
Radiological Detection System	Sub Allot	JPEO CBD : Aberdeen, MD.	1.927	-		-		-		-		-	-	-	-
Active Prevention System	TBD	TBD : TBD	-	-		-		5.836		-		5.836	Continuing	Continuing	-
Subtotal			1.927	-		0.550		5.836		-		5.836	Continuing	Continuing	N/A

Remarks

NA

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	1.927	-		0.550		5.836		-		5.836	Continuing	Continuing	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense

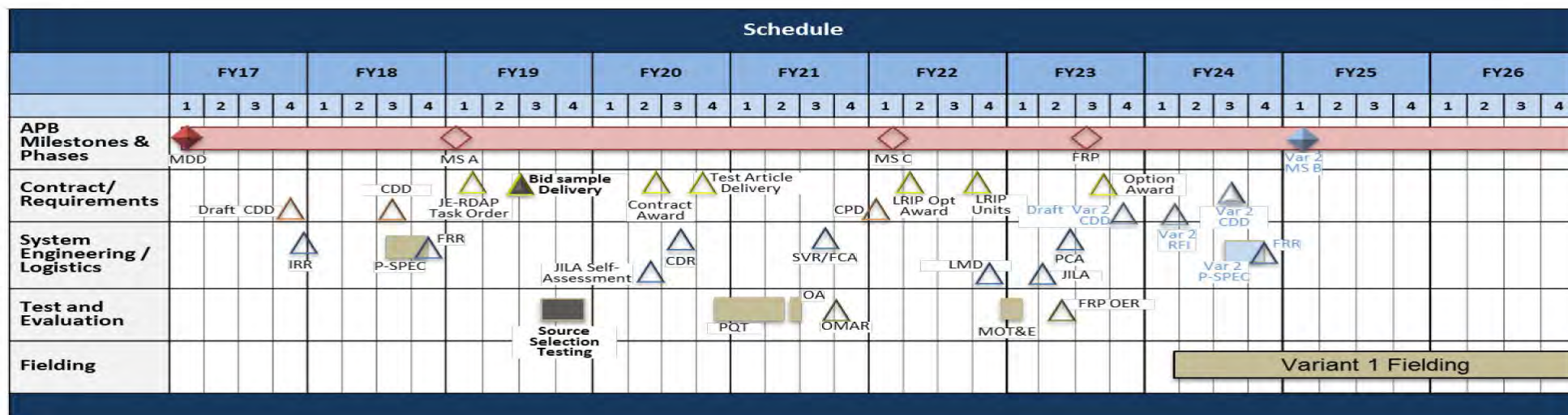
Date: February 2019

Appropriation/Budget Activity
0400 / 4

R-1 Program Element (Number/Name)
PE 0603161D8Z / Nuclear and
Conventional Physical Security/Countering
Nuclear Threats

Project (Number/Name)
041 / CNT Prevention ADC&P

Radioisotope Identification Device



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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Office of the Secretary Of Defense			Date: February 2019
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0603161D8Z / <i>Nuclear and Conventional Physical Security/Countering Nuclear Threats</i>	Project (Number/Name) 041 / <i>CNT Prevention ADC&P</i>	

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>Radioisotope Identification Device</i>				
Radioisotope Identification Device	1	2018	4	2019
<i>Active Prevention System</i>				
Active Prevention System	1	2020	4	2024

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 4					R-1 Program Element (Number/Name) PE 0603161D8Z / Nuclear and Conventional Physical Security/Countering Nuclear Threats				Project (Number/Name) 040 / National Technical Nuclear Forensics Systems			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
040: National Technical Nuclear Forensics Systems	37.815	1.578	0.225	1.725	-	1.725	1.725	2.725	1.725	1.227	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Nuclear forensics is the thorough collection, analysis and evaluation of radiological and nuclear material in a pre-detonation state and post-detonation radiological or nuclear materials, devices and debris, as well as the immediate effects created by a nuclear detonation. The ability to identify the source of nuclear material from radioactive debris is critical to our national defense and security. Swift and accurate forensic and attribution (identification) capabilities are vital to developing an appropriate national response to a nuclear event and preventing future attacks in a timely manner.

A credible nuclear forensics program is essential to preventing nuclear terrorism by deterring nations from sponsoring nuclear terrorism. The purpose of this program is to develop systems to provide timely and accurate information to national leadership in the area of nuclear forensics.

Per DoDD 2060.04 OSD AT&L NCB provides guidance and direction for the implementation of the Department of Defense National Technical Nuclear Forensics program. NCB represents DoD interests in all areas of nuclear forensics but emphasizes post-detonation applications due to Presidential guidance assigning the department the lead role in develop, providing, and maintaining post-detonation nuclear forensics capability.

This PE can fund travel to support the requirements of this program.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
Title: National Technical Nuclear Forensics Systems	1.578	0.225	1.725
Description: Advanced development of ground based prompt diagnostic and airborne collection systems. This technology will provide new information that increases accuracy and provides an improved timeline in support of senior leadership decision making.			
FY 2019 Plans: <ul style="list-style-type: none"> • Transition Harvester PACS capability to the Air Force. This system provides a modular particulate air sampling capability that augments the Department of Defense mobile nuclear air sampling capability to support collection requirements for treaty verification and National Technical Nuclear Forensics. • Conduct the Nuclear Testing, Diagnostics, Forensics and Stockpile Stewardship Course. This course seeks to enhance the education of the Military & Federal workforce in areas critical to the Stockpile Stewardship Program, and also to include 			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0603161D8Z / <i>Nuclear and Conventional Physical Security/Countering Nuclear Threats</i>	Project (Number/Name) 040 / <i>National Technical Nuclear Forensics Systems</i>	

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
<p>applications to synergistic capabilities such as technical nuclear forensics in order to facilitate technical and professional development and increase understanding of the history of nuclear weapons development, testing and design, and the interdependence between technical nuclear forensics and the nuclear weapons program as an integral component.</p> <p><i>FY 2020 Plans:</i></p> <ul style="list-style-type: none"> • Conduct the Nuclear Testing, Diagnostics, Forensics and Stockpile Stewardship Course. This course seeks to enhance the education of the Military & Federal workforce in areas critical to the Stockpile Stewardship Program, and also to include applications to synergistic capabilities such as technical nuclear forensics in order to facilitate technical and professional development and increase understanding of the history of nuclear weapons development, testing and design, and the interdependence between technical nuclear forensics and the nuclear weapons program as an integral component. • Advanced research and development to support DoD nuclear forensics capabilities. <p><i>FY 2019 to FY 2020 Increase/Decrease Statement:</i></p> <p>Harvester PACS capability is being transitioned to the Air Force starting in FY19. FY20 increase in funding for advanced research and development to support DoD nuclear forensics capabilities.</p>			
Accomplishments/Planned Programs Subtotals	1.578	0.225	1.725

C. Other Program Funding Summary (\$ in Millions) N/A	Remarks	
D. Acquisition Strategy N/A		
E. Performance Metrics The program performance metrics are established/approved through the Program Manager. The cost, schedule and technical progress is reviewed on a quarterly basis. Performance variances are addressed and corrective action(s) is(are) implemented as necessary. This is new program focusing on advanced development to meet critical needs.		

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense												Date: February 2019			
Appropriation/Budget Activity 0400 / 4						R-1 Program Element (Number/Name) PE 0603161D8Z / Nuclear and Conventional Physical Security/Countering Nuclear Threats				Project (Number/Name) 040 / National Technical Nuclear Forensics Systems					
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Harvester Particulate Airborne Collection System	Various	Various : Various	14.078	1.327		-		-		-		-	Continuing	Continuing	-
Modular Whole-air Collection System	Various	Various : Various	1.622	-		-		-		-		-	Continuing	Continuing	-
DISCREET OCULUS / United States Prompt Diagnostics System	Various	Various : Various	19.017	-		-		-		-		-	Continuing	Continuing	-
SOCOM Rendor Safe	Various	Various : Various	1.951	-		-		-		-		-	Continuing	Continuing	-
Global Initiative Information Portal	IA	Department of State : Washington, DC	0.656	-		-		-		-		-	Continuing	Continuing	-
Nuclear Forensics Development	MIPR	Multiply Performers : Multiply Locations	-	-		-		1.530		-		1.530	Continuing	Continuing	-
Subtotal			37.324	1.327		-		1.530		-		1.530	Continuing	Continuing	N/A
Remarks NA															
Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Nuclear Testing, Diagnostics, Forensics and Stockpile Stewardship Course	IA	DOE : Livermore, CA	0.398	0.251		0.225		0.195		-		0.195	Continuing	Continuing	-
IDA - CNT Goals & Approaches	Sub Allot	IDA : Alexandria, VA	0.093	-		-		-		-		-	Continuing	Continuing	-
Subtotal			0.491	0.251		0.225		0.195		-		0.195	Continuing	Continuing	N/A
Remarks NA															

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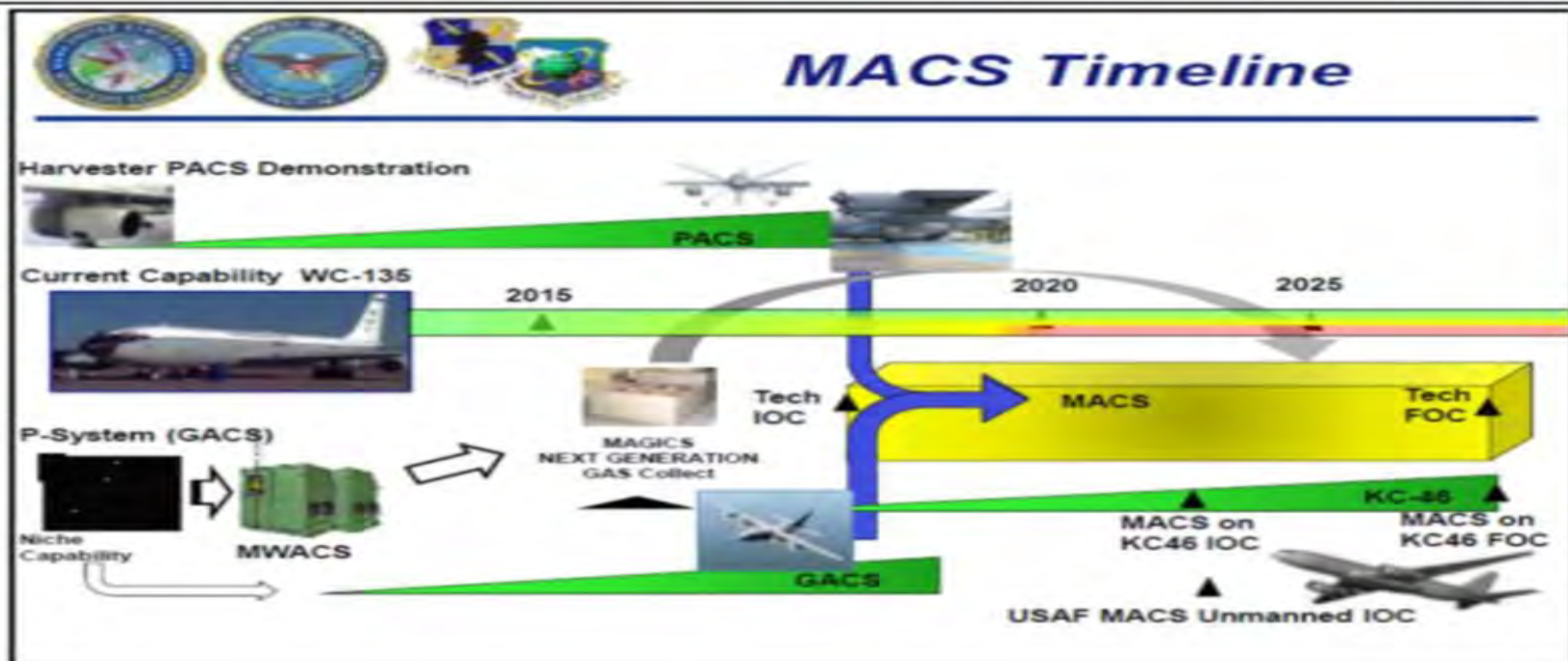
Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense										Date: February 2019			
Appropriation/Budget Activity 0400 / 4					R-1 Program Element (Number/Name) PE 0603161D8Z / <i>Nuclear and Conventional Physical Security/Countering Nuclear Threats</i>					Project (Number/Name) 040 / <i>National Technical Nuclear Forensics Systems</i>			
	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	37.815	1.578		0.225		1.725		-		1.725	Continuing	Continuing	N/A
Remarks NA													

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0603161D8Z / Nuclear and Conventional Physical Security/Countering Nuclear Threats	Project (Number/Name) 040 / National Technical Nuclear Forensics Systems

Harvester Particulate Airborne Collection System & Modular Whole-air Collection System

Particulate Airborne Collection System and Modular Whole-air Collection System Timeline



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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Office of the Secretary Of Defense			Date: February 2019
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0603161D8Z / <i>Nuclear and Conventional Physical Security/Countering Nuclear Threats</i>	Project (Number/Name) 040 / <i>National Technical Nuclear Forensics Systems</i>	

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>Modular Airborne Collection Systems</i>				
Modular Airborne Collection Systems	1	2014	4	2018
<i>Nuclear Testing, Diagnostics, Forensics and Stockpile Stewardship Course</i>				
Nuclear Testing, Diagnostics, Forensics and Stockpile Stewardship Course	1	2018	4	2024

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 4:</i> <i>Advanced Component Development & Prototypes (ACD&P)</i>					R-1 Program Element (Number/Name) PE 0603600D8Z I <i>WALKOFF</i>							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	96.038	98.920	92.012	92.791	-	92.791	94.589	96.515	98.045	100.124	Continuing	Continuing
600: <i>WALKOFF</i>	96.038	98.920	92.012	92.791	-	92.791	94.589	96.515	98.045	100.124	Continuing	Continuing

A. Mission Description and Budget Item Justification

Classified

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	101.714	92.222	93.056	-	93.056
Current President's Budget	98.920	92.012	92.791	-	92.791
Total Adjustments	-2.794	-0.210	-0.265	-	-0.265
• Congressional General Reductions	-0.196	-0.210			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-2.598	-			
• Departmental Adjustment	-	-	-0.265	-	-0.265

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
600: WALKOFF	96.038	98.920	92.012	92.791	-	92.791	94.589	96.515	98.045	100.124	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Classified.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
Title: WALKOFF	98.920	92.012	92.791
Description: Classified.			
FY 2019 Plans: Classified.			
FY 2020 Plans: Classified			
FY 2019 to FY 2020 Increase/Decrease Statement: No significant change.			
Accomplishments/Planned Programs Subtotals	98.920	92.012	92.791

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

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• 0603600D8Z O&M DW: WALKOFF	2.660	3.743	4.186	-	4.186	4.239	4.296	4.348	4.689	Continuing	Continuing

Remarks

D. Acquisition Strategy

Classified.

E. Performance Metrics

Classified.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0603600D8Z / <i>WALKOFF</i>	Project (Number/Name) 600 / <i>WALKOFF</i>
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Remarks

Classified.

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense																Date: February 2019			
Appropriation/Budget Activity								R-1 Program Element (Number/Name)								Project (Number/Name)			
0400 / 4								PE 0603600D8Z / WALKOFF								600 / WALKOFF			

	FY 2011				FY 2012				FY 2013				FY 2014				FY 2015				FY 2016				FY 2017			
	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
Classified																												
Classified																												

	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Classified																												
Classified																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0603600D8Z / WALKOFF	Project (Number/Name) 600 / WALKOFF

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Classified				
Classified	1	2014	4	2024

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity					R-1 Program Element (Number/Name)							
0400: Research, Development, Test & Evaluation, Defense-Wide I BA 4: Advanced Component Development & Prototypes (ACD&P)					PE 0603821D8Z I Acquisition Enterprise Data & Information Services							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	1.761	2.194	2.500	5.659	-	5.659	6.527	6.626	5.883	5.372	Continuing	Continuing
840: Acquisition Enterprise Data & Information Services	1.761	2.194	2.500	5.659	-	5.659	6.527	6.626	5.883	5.372	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Acquisition Enterprise Data & Information Services (AEDIS) investment supports enhanced Acquisition Visibility (AV) for the Defense Acquisition Executive (DAE), Component Acquisition Executives (CAE), Service Chiefs of Staff, OSD senior leaders, and OSD and Component analysts who assess and decide the efficiency and effectiveness of acquiring and sustaining the Department's acquisition programs including Major Defense Acquisition Programs (MDAPs), Major IT investments, and Acquisition Category (ACAT) II – IV programs. AEDIS/AV supports DAE, CAE, and Service Chief responsibilities by providing critical information for acquisition analysis, oversight, and decisions. AEDIS/AV institutionalizes the management of data and business rules used in the Department's acquisition decision making, and it integrates the acquisition data stored across multiple disparate Federal and Departmental organizations' data sets and systems. The AEDIS/AV investment delivers a Department-wide accessible collection of acquisition information, techniques, and tools, including the Defense Acquisition Visibility Environment (DAVE), the Defense Acquisition Management Information Retrieval (DAMIR) capability, and acquisition data analysis capabilities as well as data access services and data standards via the Acquisition Visibility Data Matrix (AVDM). Funding supports enhancements to Acquisition Visibility through the definition, development, and fielding of concepts and tools for Department-wide data analysis for use across Congress and the Department, particularly in support of the DAE and his decision authority.

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	2.198	2.506	5.871	-	5.871
Current President's Budget	2.194	2.500	5.659	-	5.659
Total Adjustments	-0.004	-0.006	-0.212	-	-0.212
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-0.006			
• SBIR/STTR Transfer	-	-			
• Programming	-	-	-0.212	-	-0.212
• FFRDC	-0.004	-	-	-	-

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I</i> BA 4: <i>Advanced Component Development & Prototypes (ACD&P)</i>		R-1 Program Element (Number/Name) PE 0603821D8Z <i>I Acquisition Enterprise Data & Information Services</i>	
<p>Change Summary Explanation</p> <p>FY19 reduction from FY18 PB due to anticipated lower inflationary pressures on software licensing required to maintain Acquisition Enterprise Data & Information Services related capabilities.</p> <p>Program increase supports development and prototyping of additional new capabilities to manage and measure Major Defense Acquisition Program ACAT II and III program data, Nuclear Command, Control, and Communications program data, and Middle Tier of Acquisition program data.</p>			
C. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
Title: Acquisition Enterprise Data & Information Services		2.194	2.500
<p>Description: Acquisition Enterprise Data & Information Services investments enhance the visibility of the Department's acquisition programs for the Defense Acquisition Executive (DAE), Component Acquisition Executives (CAE), Service Chiefs of Staff, OSD senior leaders, and OSD and Component analysts.</p> <p>FY 2019 Plans: FY2019 plans include continued development and prototyping of legacy capabilities transitioning to Defense Acquisition Visibility Environment (DAVE), as well as development and prototyping of new acquisition visibility capabilities and applications to improve analysis and decision-making, including Mid-Tier Acquisition and Nuclear Command Control capabilities.</p> <p>FY 2020 Plans: FY2020 plans include continued development and prototyping of legacy capabilities transitioning to Defense Acquisition Visibility Environment (DAVE), as well as development and prototyping of new acquisition visibility capabilities and applications to improve analysis and decision-making.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY20 increase to support expanded acquisition data analytics capabilities, increase the development velocity of the Defense Acquisition Visibility Environment, and prototype new capabilities to enhance oversight of Mid-Tier Acquisitions and Nuclear Communications, Command, and Control programs.</p>			
Accomplishments/Planned Programs Subtotals		2.194	2.500
D. Other Program Funding Summary (\$ in Millions) N/A			
Remarks			
E. Acquisition Strategy Acquisition Enterprise Data & Information Services development and prototyping is acquired through a combination of small-disadvantaged business contract awards.			

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
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	
F. Performance Metrics Code coverage reports must demonstrate a minimum of 80% code coverage for automated testing. Delivered capabilities must not exceed 0.5% unscheduled down time annually.		

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense												Date: February 2019			
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			
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
DAVE Development	Option/ FFP	Koniag Information Security Services : Chantilly, VA	1.761	2.194	Jul 2018	2.500	Jul 2019	5.659		-		5.659	Continuing	Continuing	N/A
Subtotal			1.761	2.194		2.500		5.659		-		5.659	Continuing	Continuing	N/A
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			1.761	2.194		2.500		5.659		-		5.659	Continuing	Continuing	N/A
Remarks NA															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense			Date: February 2019
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	

	FY 2011				FY 2012				FY 2013				FY 2014				FY 2015				FY 2016				FY 2017			
	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
Defense Acquisition Visibility Environment (DAVE) Development																												
Program List Capability Development																												
Program Information Capability Development																												
Program Schedule Capability Development																												
Business Intelligence & Analytics Development																												
DAVE Operational Capability																												
DAMIR Transition to DAVE																												
SIPR DAVE Development and Deployment																												
Legacy Application Transition to DAVE																												
DAVE Enhancement Prototyping																												
SIPR DAVE Enhancement Prototyping																												

	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Defense Acquisition Visibility Environment (DAVE) Development																												
Program List Capability Development																												
Program Information Capability Development																												
Program Schedule Capability Development																												
Business Intelligence & Analytics Development																												
DAVE Operational Capability																												
DAMIR Transition to DAVE																												

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0603821D8Z / <i>Acquisition Enterprise Data & Information Services</i>	Project (Number/Name) 840 / <i>Acquisition Enterprise Data & Information Services</i>
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	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
SIPR DAVE Development and Deployment																												
Legacy Application Transition to DAVE																												
DAVE Enhancement Prototyping																												
SIPR DAVE Enhancement Prototyping																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0603821D8Z / <i>Acquisition Enterprise Data & Information Services</i>	Project (Number/Name) 840 / <i>Acquisition Enterprise Data & Information Services</i>
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Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>Defense Acquisition Visibility Environment (DAVE) Development</i>				
Program List Capability Development	1	2018	3	2018
Program Information Capability Development	2	2018	4	2018
Program Schedule Capability Development	2	2018	4	2018
Business Intelligence & Analytics Development	1	2018	2	2018
DAVE Operational Capability	4	2017	4	2018
DAMIR Transition to DAVE	2	2017	1	2019
SIPR DAVE Development and Deployment	1	2018	4	2018
Legacy Application Transition to DAVE	1	2019	1	2021
DAVE Enhancement Prototyping	1	2019	4	2022
SIPR DAVE Enhancement Prototyping	1	2019	4	2022

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity					R-1 Program Element (Number/Name)							
0400: Research, Development, Test & Evaluation, Defense-Wide / BA 4: Advanced Component Development & Prototypes (ACD&P)					PE 0603851D8Z / Environmental Security Technology Certification Program							
COST (\$ in Millions)	Prior Years (+)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	366.844	53.342	41.925	66.572	-	66.572	64.283	58.308	59.447	60.629	Continuing	Continuing
514: Environmental Security Technology Certification Program	360.844	53.342	41.925	66.572	-	66.572	64.283	58.308	59.447	60.629	Continuing	Continuing

⁽⁺⁾ The sum of all Prior Years is \$6.000 million less than the represented total due to several projects ending

Note

The FY2020 funding request was increased by \$9.5 million as a result of rephrasing of FY2019 funds.

A. Mission Description and Budget Item Justification

(U) 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. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	54.583	40.016	59.520	-	59.520
Current President's Budget	53.342	41.925	66.572	-	66.572
Total Adjustments	-1.241	1.909	7.052	-	7.052
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	0.000	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	2.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-1.136	0.000			
• FFRDC	-0.105	-0.091	-	-	-
• Rephasing	-	0.000	9.548	-	9.548
• Canceled	-	0.000	-	-	-

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense				Date: February 2019			
Appropriation/Budget Activity			R-1 Program Element (Number/Name)				
0400: Research, Development, Test & Evaluation, Defense-Wide I BA 4: Advanced Component Development & Prototypes (ACD&P)			PE 0603851D8Z I Environmental Security Technology Certification Program				
• Realign for A&S Core Mission			-	-	-2.496	-	-2.496
<u>Change Summary Explanation</u>							
Funds rephase from FY19 to FY20 and FY21 to aid in increasing program execution rates closer to the DoD benchmarks. Congressional Adds for PFAS Demonstration Projects. Realignment of funding in support of A&S's core mission requirements.							

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 4					R-1 Program Element (Number/Name) PE 0603851D8Z / Environmental Security Technology Certification Program				Project (Number/Name) 514 / Environmental Security Technology Certification Program			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
514: Environmental Security Technology Certification Program	360.844	53.342	41.925	66.572	-	66.572	64.283	58.308	59.447	60.629	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

(U) 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 2018	FY 2019	FY 2020
Title: Environmental Technology Demonstration/Validation	31.382	24.710	39.226
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 2019 Plans: New investments in detection, quantification and remediation of per- and polyfluorinated substances, large-scale demonstration of low-frequency acoustic systems for underwater UXO detection and classification, monitoring technologies to facilitate the management of threatened and endangered species, and surface preparation for corrosion control.			
FY 2020 Plans: Continued investments in detection, quantification and remediation of per- and polyfluorinated substances, large-scale demonstration of low-frequency acoustic systems for underwater UXO detection and classification, monitoring technologies to facilitate the management of threatened and endangered species, and surface preparation for corrosion control. New investments in fore management technologies for DoD Installations and demonstration of alternative formulations for Aqueous Fire Fighting Foam.			
FY 2019 to FY 2020 Increase/Decrease Statement:			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0603851D8Z / <i>Environmental Security Technology Certification Program</i>	Project (Number/Name) 514 / <i>Environmental Security Technology Certification Program</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
Increase reflects rephrasing of resources from FY 2019..			FY 2020
Title: Energy Technology Demonstration/Validation 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 2019 Plans: Demonstration in FY-19 will continue the emphasis on cyber-security as it relates to installation energy savings and security. Reaping the advantages of modern energy monitoring tools has proven difficult for the DoD because of the need to limit access to base IT networks. ESTCP continues to demonstrate technologies and monitoring schemes that are able to obtain Authority-to-Operate on DoD networks. FY 2020 Plans: Demonstration in FY-20 will continue the emphasis on cyber-security as it relates to installation energy savings and security. ESTCP continues to demonstrate technologies and monitoring schemes that are able to obtain Authority-to-Operate on DoD networks and develops a Department-wide strategy for implementation. FY 2019 to FY 2020 Increase/Decrease Statement: Increase reflects rephrasing of resources due to execution delays.		21.960	17.215
Accomplishments/Planned Programs Subtotals		53.342	41.925
C. Other Program Funding Summary (\$ in Millions)			
N/A			
Remarks			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0603851D8Z / <i>Environmental Security Technology Certification Program</i>	Project (Number/Name) 514 / <i>Environmental Security Technology Certification Program</i>

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.

E. Performance Metrics

Performance in this program is monitored at two levels. At the lowest level, each individual project is measured against technical and financial milestones on a quarterly and annual basis. At a program-wide level, progress is measured against DoD's environmental requirements and the demonstration and transition of technologies that address these requirements.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense												Date: February 2019			
Appropriation/Budget Activity 0400 / 4						R-1 Program Element (Number/Name) PE 0603851D8Z / Environmental Security Technology Certification Program				Project (Number/Name) 514 / Environmental Security Technology Certification Program					
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Support Contract	C/IDDQ	Noblis : Reston, VA	16.851	2.940		2.940		2.940		-		2.940	Continuing	Continuing	-
Subtotal			16.851	2.940		2.940		2.940		-		2.940	Continuing	Continuing	N/A
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Energy and Water	C/Various	Various : Various	149.353	21.960		18.082		27.346		-		27.346	Continuing	Continuing	-
Weapons Systems and Platforms	C/Various	Various : Various	55.291	9.208		5.589		10.518		-		10.518	Continuing	Continuing	-
Munitions Response	C/Various	Various : Various	37.383	5.300		5.142		8.414		-		8.414	Continuing	Continuing	-
Environmental Restoration	C/Various	Various : Various	66.432	10.051		6.483		11.569		-		11.569	Continuing	Continuing	-
Resource Conservation and Resiliency	C/Various	Various : Various	35.534	3.883		3.689		5.785		-		5.785	Continuing	Continuing	-
Subtotal			343.993	50.402		38.985		63.632		-		63.632	Continuing	Continuing	N/A
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			360.844	53.342		41.925		66.572		-		66.572	Continuing	Continuing	N/A
Remarks															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0603851D8Z / Environmental Security Technology Certification Program	Project (Number/Name) 514 / Environmental Security Technology Certification Program
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ID	Task Name	Start	Finish	2019				2020				2021	
				Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2
1	FY-19 In-Progress Reviews	09/01/19	11/30/19										
2	Develop FY-20 Program	01/01/19	09/30/19										
3	FY-20 In-Progress Reviews	02/01/20	11/30/20										
4	Develop FY-21 Program	01/01/20	09/30/20										

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Office of the Secretary Of Defense			Date: February 2019
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0603851D8Z / <i>Environmental Security Technology Certification Program</i>	Project (Number/Name) 514 / <i>Environmental Security Technology Certification Program</i>	

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>In Progress Reviews</i>				
FY 2018 In Progress Reviews	2	2019	1	2020
FY 2019 In Progress Reviews	2	2020	1	2021
<i>Develop Program</i>				
Develop FY 2019 Program	2	2019	4	2019
Develop FY 2020 Program	2	2020	4	2020

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 0603920D8Z I Humanitarian De-mining							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	67.204	10.519	11.262	10.820	-	10.820	11.031	11.267	11.260	11.260	Continuing	Continuing
920: Humanitarian De-mining	67.204	10.519	11.262	10.820	-	10.820	11.031	11.267	11.260	11.260	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

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 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 (HDTTC) in support of mil-to-mil training and partnerships. Since 1995 the program has fielded technologies for 223 evaluations in 40 countries, including Afghanistan, Iraq, Vietnam, Cambodia, Angola and Zimbabwe. The program's technologies have cleared 60.2 million square meters of the world's toughest minefields, and found or destroyed 197,328 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.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0603920D8Z I <i>Humanitarian De-mining</i>
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B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	10.816	11.347	10.820	-	10.820
Current President's Budget	10.519	11.262	10.820	-	10.820
Total Adjustments	-0.297	-0.085	0.000	-	0.000
• Congressional General Reductions	-	-0.085			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.297	-			

Change Summary Explanation

Reductions were in support of Departmental efficiencies and economic assumptions.

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
Title: 0603920D8Z - SO/LIC Humanitarian De-mining	10.519	11.262	10.820
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 Countermining 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 2019 Plans: <ul style="list-style-type: none"> • Deploy new technology, including Scorpion to Afghanistan; Little Storm to Cambodia; HSTAMIDS to Colombia; Scorpion and Bearcat to Laos; HSTAMIDS to Lebanon; Primetech to Sri Lanka; and Traxx to Ukraine • Complete ongoing equipment developments/modifications and test technology including survey and mine/UXO detection technologies such as Combined Auxiliary Positioning System, Delta-2, Empact 3D, MDS-10, VMH4, F3C, CMD3; and vegetation and mine clearance and neutralization technologies such as Robomax, Robocut, Primetech, and Little Storm • Continue successful operational evaluations from FY2018 • Support the combatant commands and Embassy staffs by conducting new site surveys and country assessments in Colombia, Laos, Lebanon, Palau, Sri Lanka, Ukraine, and Vietnam • Develop, test and evaluate new prototype technologies based on feedback from the field 			
FY 2020 Plans: <ul style="list-style-type: none"> • Deploy new technology to Colombia, Iraq, Laos, Lebanon, potentially Syria and other countries 			

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I</i> BA 4: <i>Advanced Component Development & Prototypes (ACD&P)</i>		R-1 Program Element (Number/Name) PE 0603920D8Z <i>I Humanitarian De-mining</i>		
C. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<ul style="list-style-type: none"> • Complete ongoing equipment developments/modifications • Continue successful operational evaluations from FY2019 • Support the combatant commands and Embassy staffs by conducting new site surveys and country assessments • Develop, test and evaluate new prototype technologies based on feedback from the field in the following areas: technical survey, individual mine/UXO and minefield detection, mechanical mine/UXO and vegetation clearance, underwater UXO detection and clearance, mechanical mine neutralization, and post-clearance QA <p><i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> Decrease from FY19 to FY20 to be achieved by reducing operating costs.</p>				
Accomplishments/Planned Programs Subtotals		10.519	11.262	10.820
D. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
E. Acquisition Strategy				
Following a rapid prototyping strategy, the program emphasizes the use/modification of existing, commercially-available equipment and components to build functional prototype equipment suited for humanitarian demining operations. This approach is required due to the immediate need for new demining technologies in the face of ongoing U.S. forces and host nation citizen casualties in mine-affected countries. The program evaluates prototype equipment by acquiring it off-the-shelf from industry using competition to the extent possible, by leveraging ongoing countermine R&D efforts in other U.S. and foreign R&D activities, and by taking advantage of extensive in-house fabrication capabilities at the Army's Night Vision and Electronic Sensors Division (NVESD).				
F. Performance Metrics				
Long Term Strategies: Obtain adequate funding to support critical shortfalls; prioritize proposals that are deemed acceptable and allocate funding accordingly; and establish outreach programs to leverage institutional knowledge and expertise.				
Performance Indicator and Rating:				
FY 2018 Target:				
90% of currently funded research technologies are completed on time and within budget				
Complete scheduled R&D project tasks				
Transition field-ready technologies to host nation demining partners				
FY 2019 Target:				
90% of currently funded research technologies are completed on time and within budget				

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
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 0603920D8Z I Humanitarian De-mining	
Complete scheduled R&D project tasks Transition field-ready technologies to host nation demining partners Conduct biennial Humanitarian R&D Program Requirements Workshop FY 2018 Performance Rating: Funded research technologies were completed per the target. Verification: The Humanitarian Demining Program performs program reviews with other USG agencies (DOS PM WRA, DSCA, HDTC, CENTCOM, PACOM, SOUTHCOM, AFRICOM, EUCOM) and has oversight from OSD SO/LIC. Validation: Completed R&D products increase the capabilities of the DoD to effectively perform demining missions.		

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0603920D8Z / Humanitarian De-mining	Project (Number/Name) 920 / Humanitarian De-mining
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Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Primary Hardware Development	Various	RDECOM-NVESD : Ft Belvoir, VA	39.215	4.914		5.321		5.059		-		5.059	Continuing	Continuing	-
Subtotal			39.215	4.914		5.321		5.059		-		5.059	Continuing	Continuing	N/A

Remarks

The HD R&D Program adapts commercial-off-the-shelf equipment, integrates mature technologies, and leverages R&D activity within DoD, particularly in the Army's Night Vision and Electronic Sensors Directorate (NVESD) Tactical Countermining mission area.

Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Humanitarian Demining Research and Development Program	Various	RDECOM-NVESD : Ft Belvoir, VA	25.988	5.335		5.670		5.489		-		5.489	Continuing	Continuing	-
Subtotal			25.988	5.335		5.670		5.489		-		5.489	Continuing	Continuing	N/A

Remarks

Evaluations of HD R&D Program-developed technologies in actual minefields are conducted by host nation demining partners (foreign military, non-governmental organizations and mine action centers) and provide valuable data for US military countermining R&D and next generation HD technology developments while directly contributing to world-wide mine and UXO clearance.

Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Humanitarian Demining Program Management Support	Various	RDECOM-NVESD : Ft Belvoir, VA	2.001	0.270		0.271		0.272		-		0.272	Continuing	Continuing	-
Subtotal			2.001	0.270		0.271		0.272		-		0.272	Continuing	Continuing	N/A

Remarks

The HD R&D Program managers oversee adaptation of commercial-off-the-shelf equipment, integration of mature technologies, and leverage of R&D activity within DoD, particularly in the Army's Night Vision and Electronic Sensors Directorate (NVESD) Tactical Countermining mission area. Areas of emphasis are identified and validated at a

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0603920D8Z / <i>Humanitarian De-mining</i>	Project (Number/Name) 920 / <i>Humanitarian De-mining</i>
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Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
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 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			67.204	10.519		11.262		10.820		-		10.820	Continuing	Continuing	N/A

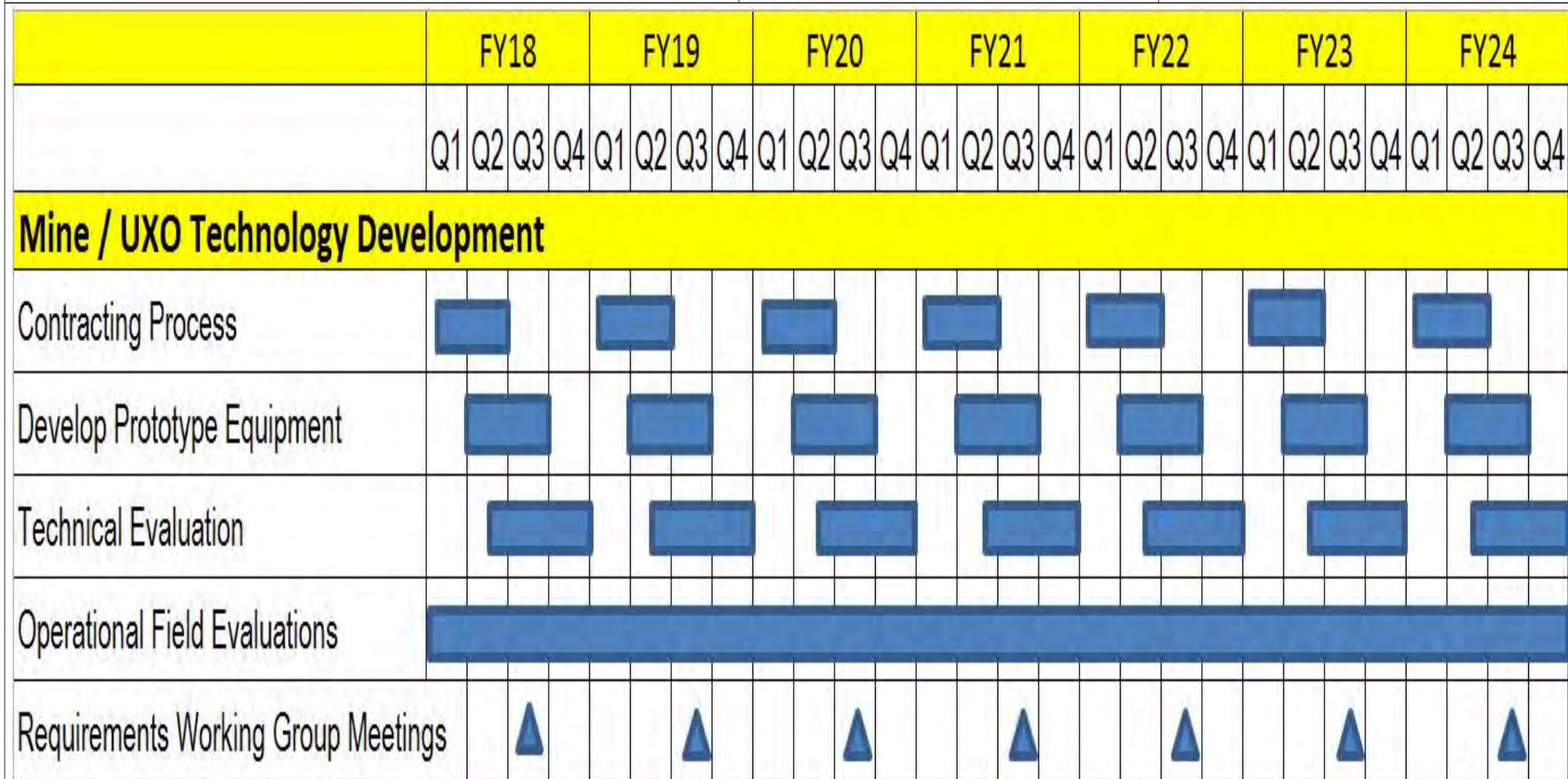
Remarks

The Humanitarian Demining Research and Development (HD R&D) program element rapidly develops, demonstrates and validates new technologies for DoD-supported nations to detect and clear landmines and unexploded ordnance (UXO), and to contribute to US military countermining 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.

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0603920D8Z / Humanitarian De-mining	Project (Number/Name) 920 / Humanitarian De-mining
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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Office of the Secretary Of Defense			Date: February 2019
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

Events	Start		End	
	Quarter	Year	Quarter	Year
Mechanical Mine/UXO Clearance Systems	1	2018	4	2024
Mine/UXO Detection Systems	1	2018	4	2024

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

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							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	62.235	10.515	8.509	11.316	-	11.316	11.050	10.317	10.501	10.499	Continuing	Continuing
923: Coalition Warfare	62.235	10.515	8.509	11.316	-	11.316	11.050	10.317	10.501	10.499	Continuing	Continuing

Note

The increase from FY2019 to FY2020 is to underpin the additional projects that support the National Defense Strategy/SecDef top three priorities.

A. Mission Description and Budget Item Justification

The Coalition Warfare Program (CWP) supports DoD organizations that: 1) work with foreign partners to collaboratively address strategic technology gaps for current and future missions; 2) develop interoperability solutions for coalition operations; and 3) develop and strengthen defense relationships. CWP is the only Office of the Secretary of Defense (OSD) program with this mission; that comprehensively addresses all three National Defense Strategy lines of effort: to develop a more lethal joint force, strengthen alliances and attract new partners, and implement business practices for greater performance and affordability. Coalition warfare and multinational operations are fundamental features of the U.S. National Security Strategy. Coalitions provide a broad base of technological, operational, and logistical support for military operations and ease the U.S. financial and manpower burdens associated with meeting military goals and objectives. Coalitions and relationships with international partners are high priorities for the nation and the Department of Defense.

CWP supplements a U.S. Government proponent's funding for cooperative efforts, ensuring U.S. funds are sufficient to complete the engagement with the foreign partner(s). When CWP funds are used to help fund a cooperative project, that project leverages technical and financial contributions of the foreign partner(s) and speeds the development and delivery of technical solutions to the warfighter. For every \$1 CWP has invested in cooperative projects, the program has leveraged \$3 in foreign partner funding – from 76 foreign partners – and \$2 in other U.S. Government funding, providing an overall 5:1 return on investment. CWP funding enables DoD project teams to move a technology into the next stage of development or to complete and transition a technology to operational forces. These projects may also form the basis for future cooperation with international partners.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I</i> BA 4: <i>Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0603923D8Z <i>I Coalition Warfare Program</i>
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B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	10.740	8.528	12.501	-	12.501
Current President's Budget	10.515	8.509	11.316	-	11.316
Total Adjustments	-0.225	-0.019	-1.185	-	-1.185
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.204	-			
• FFRDC	-0.021	-0.019	-	-	-
• Program Adjustments	-	-	-1.185	-	-1.185

Change Summary Explanation

The FY2020 funding request was reduced by \$1.185 million to account for the availability of prior year execution balances.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 4					R-1 Program Element (Number/Name) PE 0603923D8Z / Coalition Warfare Program				Project (Number/Name) 923 / Coalition Warfare			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
923: Coalition Warfare	62.235	10.515	8.509	11.316	-	11.316	11.050	10.317	10.501	10.499	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		
A. Mission Description and Budget Item Justification												
<p>The Coalition Warfare Program (CWP) supports DoD organizations that: 1) work with foreign partners to collaboratively address strategic technology gaps for current and future missions; 2) develop interoperability solutions for coalition operations; and 3) develop and strengthen defense relationships. CWP is the only Office of the Secretary of Defense (OSD) program with this mission; that 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.</p>												
<p>CWP supplements a U.S. Government proponent’s funding for cooperative efforts, ensuring U.S. funds are sufficient to complete the engagement with the foreign partner(s). When CWP funds are used to help fund a cooperative project, that project leverages technical and financial contributions of the foreign partner(s) and speeds the development and delivery of technical solutions to the warfighter. For every \$1 CWP has invested in cooperative projects, the program has leveraged \$3 in foreign partner funding – from 76 foreign partners – and \$2 in other U.S. Government funding, providing an overall 5:1 return on investment. CWP funding enables DoD project teams to move a technology into the next stage of development or to complete and transition a technology to operational forces. These projects may also form the basis for future cooperation with international partners.</p>												
B. Accomplishments/Planned Programs (\$ in Millions)									FY 2018	FY 2019	FY 2020	
Title: Coalition Warfare Program (Continuing Projects)									10.515	8.509	11.316	
Description: CWP provides funding on a competitive basis to DoD organizations to conduct cooperative research, development, test, and evaluation projects with foreign partners. The goals of the CWP program are to: collaboratively address strategic technology gaps for current and future missions, develop interoperability solutions for coalition operations, and strengthen current defense partnerships and developing new relationships. CWP selects projects for funding through an annual competitive selection process in accordance with Department of Defense and Combatant Command needs.												
Overall, the program provided additional funding to projects that began in earlier selection cycles. Currently, the funded portfolio includes projects with 13 different foreign partners.												
Including prior year project selections, for FY 2019 selections, the following projects will encompass CWP funding in FY 2019 and FY 2020:												

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0603923D8Z / <i>Coalition Warfare Program</i>	Project (Number/Name) 923 / <i>Coalition Warfare</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<ul style="list-style-type: none"> - Cold Rapid Airfield Damage Repair Solutions (US Air Force) - Autonomous Hybrid Vertical Take-Off and Landing Unmanned Aerial Systems (VTOL UAS) Carrier (US Navy) - Electromagnetic Maneuver Warfare Resource Allocation Management (US Navy) - Improvised Explosive Device Camera (US Navy) - Micro Electro Mechanical System (MEMS) Accelerometers Navigation-Grade (US Army) - Mission Partner Environment Gateway – extended (OSD CIO) - Measurements and Signals Intelligence (MASINT) sharing for Advanced Indications and Warnings (US Army) - Solid Propellant Enhanced Air-Breathing Rotating Detonation Engine Demonstration (US Navy) - Scintillation Prediction Observations Research Task (USSOUTHCOM) - Tactical High-Speed, RESponsive and Highly-Efficient Round (THRESHER) Propulsion Boost Through Burn (US Air Force) - 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. <p>FY 2019 Plans: Completion of efforts that reduce size, weight and power of imaging sensors, develop autonomous undersea power stations and improve capability of scalable warhead for an unmanned air vehicle. The Interoperability and Collaboration Initiatives Program funds efforts aimed at building partnerships, improving U.S. interoperability with foreign partners and improving collaborative project processes.</p> <p>FY 2020 Plans: Completion of efforts that will reduce size, weight, and power of non-GPS positioning, navigation, and timing processors for soldier-borne equipment; develop autonomous vertical take-off and landing unmanned aerial systems deployment and charging from mobile ground and surface vessel units; develop solid- and liquid-fueled ramjet engines, and develop a coalition interoperable electronic warfare battle management system for common operating picture.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 to FY 2020 increase is for the additional projects that support the National Defense Strategy/SecDef top three priorities.</p>			
Accomplishments/Planned Programs Subtotals		10.515	8.509
C. Other Program Funding Summary (\$ in Millions)			
N/A			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0603923D8Z / <i>Coalition Warfare Program</i>	Project (Number/Name) 923 / <i>Coalition Warfare</i>
C. Other Program Funding Summary (\$ in Millions)		
Remarks		
D. Acquisition Strategy		
<p>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.</p>		
E. Performance Metrics		
<p>After successful completion of the competitive nomination process, initial project funding is dependent on receipt of project documentation, which includes financial information, project plan, description of project team, etc. Continued project funding is dependent on compliance with CWP requirements, which include: adequate progress toward each project's stated goals, timely reporting on financial status and project activities, financial document close-out, provision of updated project plans and charts, and progress towards transition goals.</p>		

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense												Date: February 2019			
Appropriation/Budget Activity 0400 / 4						R-1 Program Element (Number/Name) PE 0603923D8Z / <i>Coalition Warfare Program</i>				Project (Number/Name) 923 / <i>Coalition Warfare</i>					
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Coalition Warfare Program Project Product Development Costs	Various	Various : Various	42.976	8.867		6.819		9.536		-		9.536	-	-	-
Subtotal			42.976	8.867		6.819		9.536		-		9.536	-	-	N/A
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Coalition Warfare Program Project Test and Evaluation Costs	Various	Various : Various	11.322	0.848		0.875		0.950		-		0.950	-	-	-
Subtotal			11.322	0.848		0.875		0.950		-		0.950	-	-	N/A
Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Coalition Warfare Program Project Management Services Costs	Various	Various : Various	7.937	0.800		0.815		0.830		-		0.830	-	-	-
Subtotal			7.937	0.800		0.815		0.830		-		0.830	-	-	N/A
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			62.235	10.515		8.509		11.316		-		11.316	-	-	N/A
Remarks															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0603923D8Z / <i>Coalition Warfare Program</i>	Project (Number/Name) 923 / <i>Coalition Warfare</i>
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<u>CWP Project Plan</u>	10/1/2018	10/1/2019	10/1/2020	10/1/2021	10/1/2022	10/1/2023	10/1/2024
FY 2018 Project Execution							
FY 2019 Project Execution							
FY 2020 Project Execution							
FY 2021 Project Execution							
FY 2022 Project Execution							
FY 2023 Project Execution							
FY 2024 Project Execution							

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Office of the Secretary Of Defense			Date: February 2019
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0603923D8Z / <i>Coalition Warfare Program</i>	Project (Number/Name) 923 / <i>Coalition Warfare</i>	

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
FY 2018 CWP Project Execution	1	2018	4	2019
FY 2019 CWP Project Execution	1	2019	4	2020
FY 2020 CWP Project Execution	1	2020	4	2021
FY 2021 CWP Project Execution	1	2021	4	2022
FY 2022 CWP Project Execution	1	2022	4	2023
FY 2023 CWP Project Execution	1	2023	4	2024
FY 2024 CWP Project Execution	1	2024	4	2024

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity					R-1 Program Element (Number/Name)							
0400: Research, Development, Test & Evaluation, Defense-Wide / BA 4: Advanced Component Development & Prototypes (ACD&P)					PE 0604016D8Z / Department of Defense Corrosion Program							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	118.491	4.503	8.458	3.365	-	3.365	3.425	3.460	3.529	3.587	Continuing	Continuing
015: Corrosion Protection Projects	118.491	4.503	8.458	3.365	-	3.365	3.425	3.460	3.529	3.587	Continuing	Continuing

A. Mission Description and Budget Item Justification

The purpose of this program is to develop a comprehensive capability to prevent and mitigate corrosion and its effects on Department of Defense (DoD) weapon systems and infrastructure. Corrosion severely impacts system and facility reliability, readiness and safety, and consumes a disproportionate amount of material and labor hours for repair and treatment of corrosion damaged systems and facilities. The cost of corrosion across the DoD is currently estimated at approximately \$19 billion per year (down from approximately \$22 billion in Fiscal Year 2007). The impact and cost of corrosion are so pervasive that Congress enacted Public Law 107-314 Sec: 1067 [portions codified in 10 U.S.C. 2228]: Prevention and mitigation of corrosion of military infrastructure and equipment. This legislation requires that DoD develop a long-term corrosion strategy to include establishment of a coordinated R&D program with transition plans. The legislation also requires that DoD designate a responsible official or organization to oversee a corrosion prevention and mitigation program. The responsibilities of the Director, Corrosion Policy and Oversight and the Military Department Corrosion Prevention and Control Executives were further delineated in DODI 5000.67 "Prevention and Mitigation of Corrosion on Military Equipment and Infrastructure" of 01 February 2010.

The Deputy Secretary of Defense designated the Principal Deputy Under Secretary of Defense (Acquisition, Technology, and Logistics) (PDUSD(AT&L)) as the DoD Corrosion Executive in May 2003. The DoD Corrosion Executive subsequently established a Corrosion Control and Oversight office to implement the program. Subsequently, in accordance with Section 371 of the 2008 National Defense Authorization Act, the Under Secretary of Defense (USD(AT&L)) designated a Director, Corrosion Policy and Oversight to perform the duties of the DoD Corrosion Executive with responsibilities as described in the 2008 NDAA legislation. A major responsibility of the Director, Corrosion Policy and Oversight is to select high payoff research and development projects that promise to prevent or mitigate corrosion and significantly reduce the total cost of corrosion along with the adverse impact of corrosion effects on weapon system and infrastructure operational capability. This office chartered a Corrosion Prevention and Control Integrated Product Team (CPCIPT) that has selected and funded Operation and Maintenance projects for each Fiscal Year (FY) commencing in FY 2005. However, the DoD CPCIPT has determined that the biggest payoff in corrosion prevention and mitigation will come from investing in up-front prevention technologies, materials, and processes to leverage downstream cost avoidance in corrosion maintenance and repair. Likewise, development of improved predictive and prognostic techniques can eliminate unseen failure and reduce unnecessary maintenance and repair costs. Thus, technology development, demonstration, and transition projects have been selected and funded since FY 2006. In addition, the University Corrosion Collaboration (now the Technical Corrosion Collaboration (TCC)) was formed as collaboration between universities, Armed Forces Academies and DoD laboratories focused on corrosion technology research and development and producing individuals with corrosion expertise for the DoD corrosion control community of the future. Research areas include performance prediction, assessment of finish, surface engineering, and product support. This advanced corrosion research has been ongoing since FY 2008 and performed by teams from TCC participating organizations.

In FY 2009, the Military Departments assigned corrosion executives and began submitting reports to Congress on inserting corrosion planning into the acquisition process. The FY 2011 NDAA added a requirement for the DoD to report the amount of funds requested in the preceding year budget for each planned project or activity,

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0604016D8Z I <i>Department of Defense Corrosion Program</i>
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as compared to the funding required for each project or activity. These funds provide a portion of the funds used to implement associated corrosion control projects and activities.

These projects address critical corrosion issues in both Department of Defense systems and infrastructure. A number of low-risk, high-payoff technologies promise to vastly improve the service life and significantly reduce the maintenance costs and improve the availability and safety of weapon systems and facilities essential to maintain support for the warfighter. A total of 151 projects have been completed to date and 111 have resulted in new technology implementation. The overall return on investment as estimated by the Military Departments is 16:1.

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	3.837	3.477	3.514	-	3.514
Current President's Budget	4.503	8.458	3.365	-	3.365
Total Adjustments	0.666	4.981	-0.149	-	-0.149
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	5.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	0.800	-			
• SBIR/STTR Transfer	-0.127	-			
• FFRDC	-0.007	-0.019	-	-	-
• Other Program Adjustments	-	-	-0.149	-	-0.149

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

Project: 015: *Corrosion Protection Projects*

Congressional Add: *Corrosion Prevention and Control Projects and Activities*

	FY 2018	FY 2019
	-	5.000
Congressional Add Subtotals for Project: 015	-	5.000
Congressional Add Totals for all Projects	-	5.000

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
015: Corrosion Protection Projects	118.491	4.503	8.458	3.365	-	3.365	3.425	3.460	3.529	3.587	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The purpose of this program is to develop a comprehensive capability to prevent and mitigate corrosion and its effects on Department of Defense (DoD) weapon systems and infrastructure. Corrosion severely impacts system and facility reliability, readiness and safety, and consumes a disproportionate amount of material and labor hours for repair and treatment of corrosion damaged systems and facilities. The cost of corrosion across the DoD is currently estimated at approximately \$19 billion per year (down from approximately \$22 billion in Fiscal Year 2007). The impact and cost of corrosion are so pervasive that Congress enacted Public Law 107-314 Sec: 1067 [portions codified in 10 U.S.C. 2228]: Prevention and mitigation of corrosion of military infrastructure and equipment. This legislation requires that DoD develop a long-term corrosion strategy to include establishment of a coordinated R&D program with transition plans. The legislation also requires that DoD designate a responsible official or organization to oversee a corrosion prevention and mitigation program. The responsibilities of the Director, Corrosion Policy and Oversight and the Military Department Corrosion Prevention and Control Executives were further delineated in DODI 5000.67 "Prevention and Mitigation of Corrosion on Military Equipment and Infrastructure" of 01 February 2010.

The Deputy Secretary of Defense designated the Principal Deputy Under Secretary of Defense (Acquisition, Technology, and Logistics) (PDUSD(AT&L)) as the DoD Corrosion Executive in May 2003. The DoD Corrosion Executive subsequently established a Corrosion Control and Oversight office to implement the program. Subsequently, in accordance with Section 371 of the 2008 National Defense Authorization Act, the Under Secretary of Defense (USD(AT&L)) designated a Director, Corrosion Policy and Oversight to perform the duties of the DoD Corrosion Executive with responsibilities as described in the 2008 NDAA legislation. A major responsibility of the Director, Corrosion Policy and Oversight is to select high payoff research and development projects that promise to prevent or mitigate corrosion and significantly reduce the total cost of corrosion along with the adverse impact of corrosion effects on weapon system and infrastructure operational capability. This office chartered a Corrosion Prevention and Control Integrated Product Team (CPCIPT) that has selected and funded Operation and Maintenance projects for each Fiscal Year (FY) commencing in FY 2005. However, the DoD CPCIPT has determined that the biggest payoff in corrosion prevention and mitigation will come from investing in up-front prevention technologies, materials, and processes to leverage downstream cost avoidance in corrosion maintenance and repair. Likewise, development of improved predictive and prognostic techniques can eliminate unseen failure and reduce unnecessary maintenance and repair costs. Thus, technology development, demonstration, and transition projects have been selected and funded since FY 2006. In addition, the University Corrosion Collaboration (now the Technical Corrosion Collaboration (TCC)) was formed as collaboration between universities, Armed Forces Academies and DoD laboratories focused on corrosion technology research and development and producing individuals with corrosion expertise for the DoD corrosion control community of the future. Research areas include performance prediction, assessment of finish, surface engineering, and product support. This advanced corrosion research has been ongoing since FY 2008 and performed by teams from TCC participating organizations.

In FY 2009, the Military Departments assigned corrosion executives and began submitting reports to Congress on inserting corrosion planning into the acquisition process. The FY 2011 NDAA added a requirement for the DoD to report the amount of funds requested in the preceding year budget for each planned project or activity,

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
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		
as compared to the funding required for each project or activity. These funds provide a portion of the funds used to implement associated corrosion control projects and activities.				
These projects address critical corrosion issues in both Department of Defense systems and infrastructure. A number of low-risk, high-payoff technologies promise to vastly improve the service life and significantly reduce the maintenance costs and improve the availability and safety of weapon systems and facilities essential to maintain support for the warfighter. A total of 151 projects have been completed to date and 111 have resulted in new technology implementation. The overall return on investment as estimated by the Military Departments is 16:1.				
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
Title: Corrosion Prevention and Control Projects and Activities		4.503	3.458	3.365
FY 2019 Plans: Continue to: <ul style="list-style-type: none">• Work with the Services to develop and transition mature technologies;• Refine and improve acquisition policies related to corrosion control;• Perform independent risk assessments relative to corrosion for ACAT I systems;• Complete impact of corrosion studies on all defense segments;• Integrate corrosion control into critical specifications and standards;• Partner with the Services to provide corrosion training to military and DoD civilians;• Engage in communication and outreach activities to create awareness of the impact of corrosion.				
FY 2020 Plans: Continue to: <ul style="list-style-type: none">• Collaborate with the Services to develop and transition mature technologies and eliminate duplicative investments in technology development;• Refine and improve acquisition policies related to corrosion control;• Support independent risk assessments relative to corrosion for ACAT I systems;• Complete impact of corrosion studies on all defense segments;• Integrate corrosion control into critical specifications and standards;• Partner with the Services to provide corrosion training to military and DoD civilians;• Engage in communication and outreach activities to create awareness of the impact of corrosion and potential solutions.				
FY 2019 to FY 2020 Increase/Decrease Statement: Level of effort is consistent between FY 2019 and FY 2020. Small changes reflect minor budget fluctuations.				
Accomplishments/Planned Programs Subtotals		4.503	3.458	3.365

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604016D8Z / <i>Department of Defense Corrosion Program</i>	Project (Number/Name) 015 / <i>Corrosion Protection Projects</i>
	FY 2018	FY 2019
Congressional Add: Corrosion Prevention and Control Projects and Activities	-	5.000
FY 2019 Plans: Increase investment in projects by \$1.5M (this is the total for the Tier 2 projects) Increase investment in TCC by \$2M (the amount Rich approved yesterday for civilian institutions) Use the remainder to do more activities related to the WIPT's.		
Congressional Adds Subtotals	-	5.000
C. Other Program Funding Summary (\$ in Millions)		
N/A		
Remarks		
D. Acquisition Strategy		
Acquisitions are accomplished in three categories including projects, research opportunities, and activities as described in the DoD Corrosion Prevention and Mitigation Strategic Plan.		
<p>Projects are funded jointly by CPO and the Military Departments and are led by subject matter experts at the Military Department laboratories. CPO issues a call for proposed project plans in April and projects are submitted in June. The project plan format is contained in the DoD Corrosion Prevention and Mitigation Strategic Plan. CPO receives project plans and convenes an evaluation panel to review proposed projects and make recommendations regarding project selection. Projects are also evaluated using Data Envelopment Analysis (DEA) to rank projects by relative efficiency. DEA factors include project performance period, ratio of OSD funding to Service funding, return-on-investment (ROI), degree to which the proposed technology addresses high-cost corrosion problems, potential benefits, joint service applicability, and probability of transition. Upon acceptance and approval of the projects, funding is distributed to the Military Departments by Military Interdepartmental Purchase Request (MIPR) based on funding priorities associated with the evaluation process results. Project execution is monitored through submission of quarterly quad charts and by conducting an annual review.</p> <p>Research opportunities are funded through the Technical Corrosion Collaboration (TCC). A call for white paper proposals is issued by CPO through an existing U.S. Air Force Academy (USAFA) Broad Agency Announcement (BAA). Submissions are evaluated by a technical panel chaired by the Deputy Director, CPO. Evaluation factors include quality of proposed research, potential impact on DoD corrosion problems, level of student involvement, and proposed collaboration between the research institutions and DoD laboratories. Projects are ranked by the selection panel and funded based on merit and available funds. Research institutions receive funds for the TCC through the establishment of cooperative agreements with USAFA. Research execution is monitored through submission of quarterly quad charts and by conducting an annual review.</p> <p>Activities are those work efforts associated with the Working Integrated Product Teams (WIPT) under the CPCIPT and include policy, training, specifications and standards, metrics, science and technology, facilities, and communication and outreach. WIPT Leads submit funding requirements associated with their annual tactical plan submission to CPO. The proposed activities are prioritized by CPO and funded based on merit and available funds. Activities are accomplished by both</p>		

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604016D8Z / <i>Department of Defense Corrosion Program</i>	Project (Number/Name) 015 / <i>Corrosion Protection Projects</i>
<p>government and contractor personnel. Funds are transferred to government personnel through the MIPR process. Funds are transferred to contractor personnel through competitively awarded contracts including the multiple-award Blanket Purchase Agreement held by CPO. Progress on activities is reviewed tri-annually at meetings of the CPCIPT.</p> <p><u>E. Performance Metrics</u> Not applicable.</p>		

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense												Date: February 2019			
Appropriation/Budget Activity 0400 / 4						R-1 Program Element (Number/Name) PE 0604016D8Z / <i>Department of Defense Corrosion Program</i>						Project (Number/Name) 015 / <i>Corrosion Protection Projects</i>			
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Corrosion Policy and Oversight	MIPR	Various (Army, Navy, Air Force) : Various	102.737	0.408	Jan 2018	8.458	Jan 2019	3.365	Jan 2020	-		3.365	Continuing	Continuing	Continuing
Subtotal			102.737	0.408		8.458		3.365		-		3.365	Continuing	Continuing	N/A
Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Corrosion Policy and Oversight	MIPR	Logistics Management Institute : McLean, VA	10.545	2.814	Oct 2017	-		-		-		-	Continuing	Continuing	Continuing
Corrosion Policy and Oversight	MIPR	Decisive Analytics Corporation : Arlington, VA	5.209	1.281	Oct 2017	-		-		-		-	Continuing	Continuing	-
Subtotal			15.754	4.095		-		-		-		-	Continuing	Continuing	N/A
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			118.491	4.503		8.458		3.365		-		3.365	Continuing	Continuing	N/A
Remarks N/A															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense

Date: February 2019

[illegible]

0400 / 4

R-1 Program Element (Number/Name)	Program Element Description	Program Element Type	Program Element Status	Program Element Location	Program Element Contact	Program Element Date	Program Element Comments

PE 0604016D8Z / Department of Defense
Corrosion Program

Project (Number/Name)	Start Date	End Date	Duration (Days)	Project Manager	Status	Notes
101	2023-01-01	2023-01-15	14	John Doe	Completed	Project completed successfully.
102	2023-01-16	2023-02-01	16	Jane Smith	In Progress	On track for completion.
103	2023-02-02	2023-02-15	13	John Doe	On Hold	Waiting for client feedback.
104	2023-02-16	2023-03-01	15	Jane Smith	Completed	Project completed successfully.
105	2023-03-02	2023-03-15	13	John Doe	In Progress	Minor delays, but progressing.
106	2023-03-16	2023-03-31	15	Jane Smith	On Hold	Waiting for client feedback.
107	2023-04-01	2023-04-15	14	John Doe	Completed	Project completed successfully.
108	2023-04-16	2023-05-01	15	Jane Smith	In Progress	On track for completion.
109	2023-05-02	2023-05-15	13	John Doe	On Hold	Waiting for client feedback.
110	2023-05-16	2023-06-01	15	Jane Smith	Completed	Project completed successfully.
111	2023-06-02	2023-06-15	13	John Doe	In Progress	Minor delays, but progressing.
112	2023-06-16	2023-06-30	14	Jane Smith	On Hold	Waiting for client feedback.
113	2023-07-01	2023-07-15	14	John Doe	Completed	Project completed successfully.
114	2023-07-16	2023-08-01	15	Jane Smith	In Progress	On track for completion.
115	2023-08-02	2023-08-15	13	John Doe	On Hold	Waiting for client feedback.
116	2023-08-16	2023-09-01	15	Jane Smith	Completed	Project completed successfully.
117	2023-09-02	2023-09-15	13	John Doe	In Progress	Minor delays, but progressing.
118	2023-09-16	2023-09-30	14	Jane Smith	On Hold	Waiting for client feedback.
119	2023-10-01	2023-10-15	14	John Doe	Completed	Project completed successfully.
120	2023-10-16	2023-11-01	15	Jane Smith	In Progress	On track for completion.
121	2023-11-02	2023-11-15	13	John Doe	On Hold	Waiting for client feedback.
122	2023-11-16	2023-12-01	15	Jane Smith	Completed	Project completed successfully.
123	2023-12-02	2023-12-15	13	John Doe	In Progress	Minor delays, but progressing.
124	2023-12-16	2024-01-01	15	Jane Smith	On Hold	Waiting for client feedback.
125	2024-01-02	2024-01-15	13	John Doe	Completed	Project completed successfully.
126	2024-01-16	2024-02-01	16	Jane Smith	In Progress	On track for completion.
127	2024-02-02	2024-02-15	13	John Doe	On Hold	Waiting for client feedback.
128	2024-02-16	2024-03-01	15	Jane Smith	Completed	Project completed successfully.
129	2024-03-02	2024-03-15	13	John Doe	In Progress	Minor delays, but progressing.
130	2024-03-16	2024-03-31	15	Jane Smith	On Hold	Waiting for client feedback.
131	2024-04-01	2024-04-15	14	John Doe	Completed	Project completed successfully.
132	2024-04-16	2024-05-01	15	Jane Smith	In Progress	On track for completion.
133	2024-05-02	2024-05-15	13	John Doe	On Hold	Waiting for client feedback.
134	2024-05-16	2024-06-01	15	Jane Smith	Completed	Project completed successfully.
135	2024-06-02	2024-06-15	13	John Doe	In Progress	Minor delays, but progressing.
136	2024-06-16	2024-06-30	14	Jane Smith	On Hold	Waiting for client feedback.
137	2024-07-01	2024-07-15	14	John Doe	Completed	Project completed successfully.
138	2024-07-16	2024-08-01	15	Jane Smith	In Progress	On track for completion.
139	2024-08-02	2024-08-15	13	John Doe	On Hold	Waiting for client feedback.
140	2024-08-16	2024-09-01	15	Jane Smith	Completed	Project completed successfully.
141	2024-09-02	2024-09-15	13	John Doe	In Progress	Minor delays, but progressing.
142	2024-09-16	2024-09-30	14	Jane Smith	On Hold	Waiting for client feedback.
143	2024-10-01	2024-10-15	14	John Doe	Completed	Project completed successfully.
144	2024-10-16	2024-11-01	15	Jane Smith	In Progress	On track for completion.
145	2024-11-02	2024-11-15	13	John Doe	On Hold	Waiting for client feedback.
146	2024-11-16	2024-12-01	15	Jane Smith	Completed	Project completed successfully.
147	2024-12-02	2024-12-15	13	John Doe	In Progress	Minor delays, but progressing.
148	2024-12-16	2025-01-01	15	Jane Smith	On Hold	Waiting for client feedback.
149	2025-01-02	2025-01-15	13	John Doe	Completed	Project completed successfully.
150	2025-01-16	2025-02-01				

015 / Corrosion Protection Projects

EXHIBIT R-4. SCHEDULE PROFILE	Date: 31 July 2018																																																											
Appropriation/ Budget Category: RDT&E, CORROSION PREVENTION AND CONTROL / BA 4	Program Element: 0604016D8Z																																																											
PROJECT / TASK	2014												2015												2016												2017												2018											
	Q1			Q2			Q3			Q4			Q1			Q2			Q3			Q4			Q1			Q2			Q3			Q4			Q1			Q2			Q3			Q4														
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP												
TO 0001 : CORROSION POLICY AND OVERSIGHT																																																												
DOD 5000-Series Review	100%												100%												100%												100%												50%											
Integration of CPC and CPC-Related Policy	100%												100%												100%												25%																							
DAG Review	100%												100%												100%												50%																							
Corrosion Board of Directors	100%												100%												100%												25%																							
DOD Corrosion Prevention and Mitigation Strategic Plan	100%												100%												100%												100%																							
USC Engagement	100%												100%												100%												100%																							
GAO Engagement	100%												100%												100%												100%																							
Corrosion Technology Implementation Projects Support	100%												100%												100%												75%																							
Training Gap Analysis	100%												100%												100%												100%																							
Corrosion Website Sustainment	100%												100%												100%												70%																							
Product Introduction and Qualification Tool	100%												100%												100%												100%																							
Facilitate/Support Corrosion Events	100%												100%												100%												70%																							
International Corrosion Partnerships and Engagements	100%												100%												100%												66%																							
Programmatic Support	100%												100%												100%												100%																							
Technical Corrosion Collaboration	100%												100%												100%												80%																							
TO 0001 : CORROSION TECHNOLOGY SUPPORT																																																												
Corrosion Prevention and Control (CPC) Review	100%												100%												100%												40%																							
Guidebook and Manual Support	100%												100%												100%												100%																							
DFARS Support	100%												100%												100%												100%																							
Funding Reviews	100%												100%												100%												80%																							
Weapon Systems and Infrastructure Oversight Support	100%												100%												100%												50%																							
Military Department Corrosion Program Review	100%												100%												100%												100%																							
Corrosion Technology Implementation Project Reviews	100%												100%												100%												50%																							
Corrosion Subject Matter Expertise	100%												100%												100%												100%																							

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Office of the Secretary Of Defense			Date: February 2019
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604016D8Z / <i>Department of Defense Corrosion Program</i>	Project (Number/Name) 015 / <i>Corrosion Protection Projects</i>	

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>Corrosion Policy and Oversight</i>				
DOD 5000 Series Review	1	2017	4	2020
Integration of CPC and CPC-Related Policy	1	2017	4	2020
DAG Review	1	2017	4	2020
DOD Corrosion Prevention and Mitigation Strategic Plan	1	2017	4	2020
GAO Engagement	1	2017	4	2020
Corrosion Technology Implementation Projects Support	1	2017	4	2020
Training Gap Analysis	1	2017	4	2020
Corrosion Website Sustainment	1	2017	4	2020
Product Introduction Tool	1	2017	4	2020
Facilitate/Support Corrosion Events	1	2017	4	2020
International Corrosion Partnerships and Engagements	1	2017	4	2020
Programmatic Support	1	2017	4	2020
<i>Corrosion Technology Support</i>				
Corrosion Prevention and Control (CPC) Review	1	2017	4	2020
Guidebook and Manual Support	1	2017	4	2020
Funding Reviews	1	2017	4	2020
Weapon Systems and Infrastructure Oversight Support	1	2017	4	2020
Military Department Corrosion Program Review	1	2017	4	2020
Corrosion Technology Implementation Project Reviews	1	2017	4	2020
Corrosion Subject Matter Expertise	1	2017	4	2020

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0604132D8Z I <i>Missile Defeat Project</i>
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	138.350	121.025	43.508	17.816	-	17.816	9.897	6.924	6.917	7.064	Continuing	Continuing
072: <i>Missile Defeat Project</i>	138.350	121.025	43.508	17.816	-	17.816	9.897	6.924	6.917	7.064	Continuing	Continuing

Program MDAP/MAIS Code:
Project MDAP/MAIS Code(s): 000

A. Mission Description and Budget Item Justification

The Missile Defeat Project counters the growing global advancement and proliferation of road-mobile ballistic missile threats. The Missile Defeat Project coordinates and integrates Department of Defense and Intelligence Community efforts to develop counter-threat capability. The FY 2020 request will continue investments toward modernization of Time Sensitive Targeting Defeat capabilities identified in the 2018 National Defense Strategy for: 1) command, control, communications, computers and intelligence, surveillance and reconnaissance; joint lethality in contested environments; and, missile defense efforts.

In accordance with the National Defense Authorization Act for FY 2017, the Missile Defeat Project transferred activities initiated under the Missile Defeat to other stakeholders starting in FY 2019. In order to carry out the important effort initiated by Missile Defeat, the FY 2020 request will continue to create advanced capability for the defeat of time sensitive targets. Activities will be coordinated with the Services, appropriate Agencies and the Combatant Commands to transition these developments into viable warfighting capabilities. The Department is reviewing options to re-title this program element or transfer the remaining resources in to another program element to continue work on time sensitive targets.

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	124.769	58.607	17.867	-	17.867
Current President's Budget	121.025	43.508	17.816	-	17.816
Total Adjustments	-3.744	-15.099	-0.051	-	-0.051
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-15.000			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-3.554	-			
• FFRDC Reduction	-0.190	-0.099	-	-	-
• Other Program Adjustments	-	-	-0.051	-	-0.051

Change Summary Explanation

FY 2019 directed reduction was to a specific classified project within the program element.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 4					R-1 Program Element (Number/Name) PE 0604132D8Z / <i>Missile Defeat Project</i>				Project (Number/Name) 072 / <i>Missile Defeat Project</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
072: <i>Missile Defeat Project</i>	138.350	121.025	43.508	17.816	-	17.816	9.897	6.924	6.917	7.064	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		
Project MDAP/MAIS Code: 000												
<u>A. Mission Description and Budget Item Justification</u>												
The Missile Defeat Project will transfer all Missile Defeat initiated activities to other stakeholders starting in FY 2019. The FY 2020 investments fund operational improvements to command and control, processing, exploitation, and dissemination, and mission integration tools for the warfighter.												
<u>B. Accomplishments/Planned Programs (\$ in Millions)</u>										FY 2018	FY 2019	FY 2020
<i>Title:</i> Missile Defeat Project efforts										121.025	43.508	17.816
<i>Description:</i> This effort develops operational improvements to command & control (C2), processing, exploitation, and dissemination (PED), and mission integration tools for the warfighter.												
<i>FY 2019 Plans:</i> - Deliver post-test evaluation for time critical targeting test events. - Deliver final recommendations and analysis to the warfighter for recommendations on improved time critical targeting, concepts of operation, and missile defeat.												
<i>FY 2020 Plans:</i> Develop operational improvements to C2, PED and mission integration tools for the warfighter.												
<i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> - The FY 2019 to FY 2020 decrease is due to a transition of current activities to other stakeholders.												
Accomplishments/Planned Programs Subtotals										121.025	43.508	17.816
<u>C. Other Program Funding Summary (\$ in Millions)</u> N/A												
<u>Remarks</u>												
<u>D. Acquisition Strategy</u> The acquisition strategy consists of partnering with small businesses, industry, Federally Funded Research and Development Centers and University Affiliated Research Centers. The Office of the Secretary of Defense (OSD) will leverage DoD, the Intelligence Community, and government model-based assessments to inform acquisition decisions.												

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604132D8Z / <i>Missile Defeat Project</i>	Project (Number/Name) 072 / <i>Missile Defeat Project</i>

E. Performance Metrics

N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense												Date: February 2019			
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)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Various	C/TBD	MULTI : MULTI	138.350	121.025		43.508		17.816		-		17.816	Continuing	Continuing	-
Subtotal			138.350	121.025		43.508		17.816		-		17.816	Continuing	Continuing	N/A
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			138.350	121.025		43.508		17.816		-		17.816	Continuing	Continuing	N/A
Remarks															
N/A															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604132D8Z / <i>Missile Defeat Project</i>	Project (Number/Name) 072 / <i>Missile Defeat Project</i>
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	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
<i>Missile Defeat Project</i>																												
SIMEX JB-18 Conduct and Analysis																												
Project SKYFALL Concept Experimentation																												
Project TRIPPWIRE Concept Experimentation and Transition to Service																												
C2PED Prototyping Enhancements Concept Experimentation Time Sensitive Targeting																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Office of the Secretary Of Defense			Date: February 2019
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604132D8Z / <i>Missile Defeat Project</i>	Project (Number/Name) 072 / <i>Missile Defeat Project</i>	

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>Missile Defeat Project</i>				
SIMEX JB-18 Conduct and Analysis	1	2018	4	2019
Project SKYFALL Concept Experimentation	1	2018	2	2020
Project TRIPPWIRE Concept Experimentation and Transition to Service	1	2018	4	2020
C2PED Prototyping Enhancements Concept Experimentation Time Sensitive Targeting	1	2018	4	2022

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: March 2019
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Appropriation/Budget Activity	R-1 Program Element (Number/Name)											
0400: Research, Development, Test & Evaluation, Defense-Wide / BA 4: Advanced Component Development & Prototypes (ACD&P)	PE 0604250D8Z / Advanced Innovative Technologies											
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	1,539.914	1,423.173	1,387.539	1,312.735	-	1,312.735	818.285	517.187	207.127	176.633	Continuing	Continuing
250: Advanced Innovative Technologies	1,539.914	1,423.173	1,387.539	1,282.735	-	1,282.735	803.285	502.187	192.127	161.633	Continuing	Continuing
295: SCO Cyber Efforts	-	0.000	0.000	30.000	-	30.000	15.000	15.000	15.000	15.000	Continuing	Continuing

A. Mission Description and Budget Item Justification

The Strategic Capabilities Office (SCO) identifies, analyzes, demonstrates, and transitions game-changing applications of existing and near-term technology (and other U.S. Government capabilities) to shape and counter emerging threats. The SCO combines capability innovation with concepts of operation and information management to develop novel concepts solving critical national security challenges in partnership with the Services, Defense Agencies, Combatant Commands (CCMDS), Joint Chiefs of Staff, Intelligence Community, and the Office of the Secretary of Defense (OSD).

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	1,482.532	1,431.702	1,107.245	-	1,107.245
Current President's Budget	1,423.173	1,387.539	1,312.735	-	1,312.735
Total Adjustments	-59.359	-44.163	205.490	-	205.490
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-106.000			
• Congressional Rescissions	-	-			
• Congressional Adds	25.000	65.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	14.000	-			
• SBIR/STTR Transfer	-26.180	-			
• FFRDC Reduction Section 8024(f)	-2.179	-3.163			
• Congressional Reduction	-70.000	-			
• Other Program Adjustments	-	-	205.490	-	205.490

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

Project: 250: Advanced Innovative Technologies

Congressional Add: Smarter Machine Learning

Congressional Add: Quartermaster Pathfinder

Congressional Add Subtotals for Project: 250

FY 2018	FY 2019
24.952	24.943
-	39.909
24.952	64.852

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense		Date: March 2019	
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	
Congressional Add Details (\$ in Millions, and Includes General Reductions)		FY 2018	FY 2019
		Congressional Add Totals for all Projects	24.95264.852

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: March 2019		
Appropriation/Budget Activity 0400 / 4					R-1 Program Element (Number/Name) PE 0604250D8Z / Advanced Innovative Technologies				Project (Number/Name) 250 / Advanced Innovative Technologies			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
250: Advanced Innovative Technologies	1,539.914	1,423.173	1,387.539	1,282.735	-	1,282.735	803.285	502.187	192.127	161.633	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		
A. Mission Description and Budget Item Justification												
The Strategic Capabilities Office (SCO) identifies, analyzes, demonstrates, and transitions game-changing applications of existing and near-term technology (and other U.S. Government capabilities) to shape and counter emerging threats. The SCO combines capability innovation with concepts of operation and information management to develop novel concepts solving critical national security challenges in partnership with the Services, Defense Agencies, Combatant Commands (CCMDS), Joint Chiefs of Staff, Intelligence Community, and the Office of the Secretary of Defense (OSD).												
B. Accomplishments/Planned Programs (\$ in Millions)									FY 2018	FY 2019	FY 2020	
Title: Alternate Strike									171.508	153.033	34.637	
Description: The Alternative 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 2019 Plans:												
• Complete final design.												
• Conduct Systems Integration Lab testing.												
• Conduct environmental testing.												
• Conduct ground testing.												
FY 2020 Plans:												
• Continue ground testing.												
• Complete flight test readiness.												
FY 2019 to FY 2020 Increase/Decrease Statement:												
The decrease of \$118.396 million from FY 2019 to FY 2020 is due to due to planned program completion												
Title: Angel									-	-	95.000	
Description: Specific applications and detailed plans are available at a higher classification level. This program is a new start in FY 2020.												

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: March 2019	
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604250D8Z / <i>Advanced Innovative Technologies</i>	Project (Number/Name) 250 / <i>Advanced Innovative Technologies</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
FY 2020 Plans: Specific applications and detailed plans are available at a higher classification level. This program is a new start in FY 2020.			
FY 2019 to FY 2020 Increase/Decrease Statement: This is a new start program in FY 2020.			
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. The Aurora program is a new start in FY 2020.		-	-
FY 2020 Plans: <ul style="list-style-type: none"> • Complete final integrated architecture design • Develop decision aid model • Develop threat models • Test planning tools 			20.000
FY 2019 to FY 2020 Increase/Decrease Statement: This is a new start program in FY 2020.			
Title: Avatar 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.		24.395	49.553
FY 2019 Plans: <ul style="list-style-type: none"> • Demonstrate autonomy algorithms on platforms. • Conduct preliminary testing of prototype manned-unmanned teaming capabilities to confirm design and functionality. • Complete design review and execute vendor down-select. • Continue open systems architecture refinement. • Continue autonomous behavior algorithm refinement • Continue mission and operational effectiveness analysis 			79.172
FY 2020 Plans: Continue open systems architecture refinement. <ul style="list-style-type: none"> • Continue autonomous behavior algorithm refinement • Continue mission and operational effectiveness analysis • Continue hardware in the loop testing of prototype manned-unmanned teaming capabilities to confirm design and functionality. 			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: March 2019		
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 2018	FY 2019	FY 2020
<ul style="list-style-type: none">Continue flight demonstration of autonomy behaviors on platforms.Initiate integration of payloads onto operational platforms. <p>FY 2019 to FY 2020 Increase/Decrease Statement: The increase of \$29.619 million from FY 2019 to FY 2020 is needed to build and acquire hardware and software, integrate the components, and conduct multiple risk reduction prototype flight tests.</p>				
<p>Title: Breaker</p> <p>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.</p> <p>FY 2019 Plans:</p> <ul style="list-style-type: none">Complete payload analysisComplete payload system-subsystem design.Complete subcomponent redesign, provide hardware/ software test support, and fabricate hardware supporting engineering development testing (EDT).Complete subsystem tests to confirm final system design and functionality to be demonstrated. <p>FY 2020 Plans:</p> <ul style="list-style-type: none">Conduct and complete test equipment upgrades and provide test supportConduct and complete system build and checkout and acceptance testingConduct prototype demonstration tests. <p>FY 2019 to FY 2020 Increase/Decrease Statement: The increase of \$12.899 million from FY 2019 to FY 2020 for Breaker is consistent with the original funding profile.</p>		46.626	31.635	44.534
<p>Title: Carnac</p> <p>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.</p> <p>FY 2019 Plans:</p> <ul style="list-style-type: none">Begin data collection activities.Develop model for assessment of machine learning algorithms.Demonstrate machine learning algorithms in simulated environments.		-	22.016	22.973

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: March 2019	
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604250D8Z / <i>Advanced Innovative Technologies</i>	Project (Number/Name) 250 / <i>Advanced Innovative Technologies</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<ul style="list-style-type: none"> Complete system design. <p>FY 2020 Plans:</p> <ul style="list-style-type: none"> Continue data collection activities. Demonstrate application of machine learning algorithms. Perform test & evaluation to determine technical and operational effectiveness. <p>FY 2019 to FY 2020 Increase/Decrease Statement: The increase of \$.957 million from FY 2019 to FY 2020 is due to algorithm test and evaluation work.</p>			
<p>Title: Chaos</p> <p>Description: The Chaos program provides a novel capability to support ground operations. Specific applications and detailed plans are available at a higher classification level. The Chaos program is a new start in FY 2020.</p> <p>FY 2020 Plans:</p> <ul style="list-style-type: none"> Complete prototype design Acquire and repurpose existing hardware <p>FY 2019 to FY 2020 Increase/Decrease Statement: This is a new start program in FY 2020.</p>		-	-
<p>Title: Command and Control of the Information Environment (C2IE)</p> <p>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.</p> <p>FY 2019 Plans:</p> <ul style="list-style-type: none"> Continue program transition activities. Continue assessment of performance for additional analytic components. Continue incremental software development, system integration, and testing cycle of the C2IE software. Continue developmental, operational, and interface testing of C2IE software. Continue conducting multiple validation demonstrations and workshops for Combatant Commanders (CCMDs). Continue development of automated ingest of blue situational awareness data sources. Continue development of automated ingest of intelligence data sources. Continue development of Machine Learning solutions for entity, event and network detection. 		35.685	24.311
			16.000
			-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: March 2019		
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604250D8Z / <i>Advanced Innovative Technologies</i>	Project (Number/Name) 250 / <i>Advanced Innovative Technologies</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<ul style="list-style-type: none">• Conduct multiple operational validation demonstrations.• Complete accreditation of C2IE components and system on Joint Worldwide Intelligence Communications System (JWICS) networks.• Complete cross-domain data transfer. <p>FY 2019 to FY 2020 Increase/Decrease Statement: Program will transition to the Joint Staff as resource sponsor and requirements oversight with Air Force PEO C3I&N executing program management and acquisition strategy.</p>				
<p>Title: Contender</p> <p>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.</p> <p>FY 2019 Plans:</p> <ul style="list-style-type: none">• Complete sub-assembly lab testing.• Conduct operational testing of sub assembly components • Conduct integration and conduct full-scale lab testing• Begin fabrication & integration of prototype <p>FY 2020 Plans:</p> <ul style="list-style-type: none">• Complete prototype assemblies and system wide integration.• Complete full scale operational testing. <p>FY 2019 to FY 2020 Increase/Decrease Statement: The decrease of \$14.842 million from FY 2019 to FY 2020 is due to the shift from procurement of hardware and long lead parts and subassembly fabrication to integration and demonstration testing activities.</p>		67.916	89.363	74.521
<p>Title: Eclipse</p> <p>Description: The Eclipse program accelerates the maturation and fielding of emerging disruptive technologies. Specific applications and detailed plans are available at a higher classification level. The Eclipse program is a new start in FY 2020.</p> <p>FY 2020 Plans:</p> <ul style="list-style-type: none">• Complete prototype design• Conduct initial test <p>FY 2019 to FY 2020 Increase/Decrease Statement:</p>		-	-	25.000

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
This is a new start program in FY 2020.				
Title: Enhanced Munitions Description: Leverage existing technologies to analyze and prototype enhancements to current munitions. This project will retire risks associated with transition of enhanced munitions. Due to the nature of these projects, specific applications and detailed plans are available at a higher classification level.		29.245	-	-
Title: Ghost Fleet 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 2019 Plans: <ul style="list-style-type: none">• Complete initial platform modifications.• Complete component level testing and payload integration designs.• Complete autonomy system delivery.• Conduct initial prototype underway testing. FY 2020 Plans: <ul style="list-style-type: none">• Complete design for physical modifications of final platforms.• Conduct integration of Government Furnished Equipment.• Complete platform final alterations and sea worthiness validations.• Conduct sea-based experimentation demonstrations. FY 2019 to FY 2020 Increase/Decrease Statement: The decrease of \$.486 million from FY 2019 to FY 2020 is due to the shift from a material procurement and vessel modification period to a final integration of payloads and final demonstration period.		131.151	137.426	136.940
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. The Hoover project is a new start in FY 2018. FY 2019 Plans: <ul style="list-style-type: none">• Complete prototype design.		46.000	74.331	74.223

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: March 2019		
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 2018	FY 2019	FY 2020
<ul style="list-style-type: none">• Complete machine learning algorithms for existing sensor.• Complete test planning.• Conduct initial testing in relevant environment. <p>FY 2020 Plans:</p> <ul style="list-style-type: none">• Complete design development.• Continue integration activities.• Demonstrate machine learning algorithms in relevant environment. <p>FY 2019 to FY 2020 Increase/Decrease Statement: The decrease of \$.108 million from FY 2019 to FY 2020 is due to minor pricing adjustments.</p>				
<p>Title: Hornet's Nest</p> <p>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.</p> <p>FY 2019 Plans:</p> <ul style="list-style-type: none">• Conduct prototype build.• Continue behavior algorithms.• Conduct air and ground testing. <p>FY 2020 Plans:</p> <ul style="list-style-type: none">• Continue modeling and simulation of system.• Conduct system flight demonstration. <p>FY 2019 to FY 2020 Increase/Decrease Statement: The decrease of \$7.555 million FY 2019 to FY 2020 is due to planned program execution schedule.</p>		23.419	28.338	20.783
<p>Title: Hurt Locker</p> <p>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. New start in FY 2018.</p> <p>FY 2019 Plans:</p> <ul style="list-style-type: none">• Complete system and subcomponent designs and interface control documents.• Complete Materiel procurement of long lead items.• Begin hardware prototyping and software development.		56.200	63.428	21.772

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<ul style="list-style-type: none"> • Conduct software-in-the-loop system integration & testing. <p>FY 2020 Plans:</p> <ul style="list-style-type: none"> • Continue hardware and software system integration. • Complete hardware prototyping. • Conduct full HWIL/SWIL testing. • Complete communications testing. <p>FY 2019 to FY 2020 Increase/Decrease Statement: The decrease of \$41.656 from FY 2019 to FY 2020 is due to completing the majority of non-recurring design plans and procuring of high value materials in FY 2019.</p>			
<p>Title: Hypervelocity Gun Weapon System (HGWS)</p> <p>Description: The HGWS program provides cost-effective point defense from existing combat systems. Due to the nature of this project, specific applications and detailed plans are available at a higher classification level.</p>		65.427	-
<p>Title: Kingfisher</p> <p>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.</p> <p>FY 2019 Plans:</p> <ul style="list-style-type: none"> • Define specific weapons interface and integration requirements. • Develop preliminary weapon design. • Initiate subscale and subcomponent testing. • Develop CONOPS. <p>FY 2020 Plans:</p> <ul style="list-style-type: none"> • Complete subscale and subcomponent test. • Complete detailed weapons design. • Conduct platform integration analysis. • Develop initial SW design and builds. • Initiate full scale test planning and safety coordination. <p>FY 2019 to FY 2020 Increase/Decrease Statement:</p>		-	43.508
			76.500

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
The \$32.992 increase from FY 2019 to FY 2020 is due to increased activity to finalize design, conduct integration, complete subscale test and initiate preparations for full scale test events.				
<p>Title: LiTE Saber</p> <p>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</p> <p>FY 2019 Plans:</p> <ul style="list-style-type: none">• Conduct detailed design and systems engineering activities in support of system architecture, hardware design and platform integration requirements.• Complete design review and execute vendor down-select and follow-on contract.• Continue open systems architecture refinement.• Continue analysis to define system characteristics and effectiveness.• Demonstrate initial capability. <p>FY 2020 Plans:</p> <ul style="list-style-type: none">• Validate and Verify design and systems engineering activities in support of system architecture, hardware design and platform integration requirements.• Initiate transition to Program of Record.• Continue open systems architecture refinement.• Continue analysis to define system characteristics and effectiveness.• Complete test plan and final capability demonstration. <p>FY 2019 to FY 2020 Increase/Decrease Statement:</p> <p>The increase of \$19.685 million from FY 2019 to FY 2020 is to test and demonstrate system scalability.</p>		63.428	75.321	95.006
<p>Title: Maven</p> <p>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.</p> <p>FY 2019 Plans:</p> <ul style="list-style-type: none">• Analyze algorithm performance.• Integrate algorithms with analytic workflow leveraging existing data. <p>FY 2020 Plans:</p>		15.613	13.875	10.886

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<ul style="list-style-type: none">Continue algorithm development for improved performance.Perform test & evaluation to determine technical and operational effectiveness. <p>FY 2019 to FY 2020 Increase/Decrease Statement: The decrease of \$2.989 million FY 2019 to FY 2020 is due to a down-selection in the number of algorithm providers selected for deployment.</p>				
<p>Title: Motley Crew</p> <p>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.</p> <p>FY 2019 Plans:</p> <ul style="list-style-type: none">Integrate algorithms into weapon systems.Conduct risk reduction of weapon systems.Continue refinement of algorithms.Continue mission and operational effectiveness analysis. <p>FY 2020 Plans:</p> <ul style="list-style-type: none">Continue refinement of algorithms.Continue mission and operational effectiveness modeling and simulation.Execute final demonstration of the system. <p>FY 2019 to FY 2020 Increase/Decrease Statement: The decrease of \$18.867 million from FY 2019 to FY 2020 is due to long lead item purchases made in FY 2018.</p>		31.226	44.598	25.731
<p>Title: Perdix Gen 7</p> <p>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.</p> <p>FY 2019 Plans:</p> <ul style="list-style-type: none">Perform initial flight tests.Build and refine micro-UAV.Continue developing mission planning software.		6.831	10.902	7.917

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<ul style="list-style-type: none"> Begin test plan for final demonstration. <p>FY 2020 Plans:</p> <ul style="list-style-type: none"> Continue iterative flight testing of autonomous airborne capabilities. Complete mission planning software. Begin program of record transition activities. Conduct final prototype flight demonstration in operationally representative environment. <p>FY 2019 to FY 2020 Increase/Decrease Statement: The decrease of \$2.985 million from FY 2019 to FY 2020 is due to risk reduction activities carried out in FY 2018.</p>			
<p>Title: Red Dawn</p> <p>Description: The Red Dawn 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.</p> <p>FY 2019 Plans:</p> <ul style="list-style-type: none"> Complete weapon design. Conduct platform integration analysis and design. Develop CONOPS. Initiate subsystem procurement. <p>FY 2020 Plans:</p> <ul style="list-style-type: none"> Initiate carriage system assembly. Initiate system procurement and assembly. Conduct subsystem testing. <p>FY 2019 to FY 2020 Increase/Decrease Statement: The decrease of \$63.896 million from FY 2019 to FY 2020 is due to program baseline developing, demonstrating, and transitioning multiple capability efforts.</p>		-	72.479
<p>Title: Sea Dragon</p> <p>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.</p> <p>FY 2019 Plans:</p> <ul style="list-style-type: none"> Conduct live fire demonstration. 		353.557	46.514

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<ul style="list-style-type: none">• Commence construction of launch support test site.• Continue testing in relevant environment.• Continue planning for tactical demonstration.• Continue analysis for fire control system architectures. <p>FY 2020 Plans:</p> <ul style="list-style-type: none">• Complete testing in relevant environments.• Complete technical data package for system installation. <p>FY 2019 to FY 2020 Increase/Decrease Statement:</p> <p>The decrease of \$102.145 million from FY 2019 to FY 2020 is due to completing the majority of non-recurring design plans and procuring of high value materials in FY 2019.</p>				
<p>Title: Sea Mob</p> <p>Description: SCO is developing a group of Unmanned Surface Vehicles (USVs) capable of cooperative swarming behaviors. Due to the nature of these projects, specific applications and detailed plans are available at a higher classification level.</p>		9.914	-	-
<p>Title: Sea Stalker</p> <p>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.</p> <p>FY 2019 Plans:</p> <ul style="list-style-type: none">• Complete and demo payload/ launch system testing.• Complete effector integration and testing.• Develop and adapt secondary payload capability for platform system. <p>FY 2020 Plans:</p> <ul style="list-style-type: none">• Conduct secondary payload integrated test.• Conduct Final Demonstration <p>FY 2019 to FY 2020 Increase/Decrease Statement:</p> <p>The decrease of \$10.151 million from FY 2019 to FY 2020 is due to development costs and efforts ending and shifting support to final tests and demonstrations.</p>		26.581	25.986	15.835
<p>Title: Serenity</p>		17.565	20.813	8.907

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>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.</p> <p>FY 2019 Plans:</p> <ul style="list-style-type: none"> • Complete final prototype packaging. • Complete final operational effectiveness analysis updates. • Test and install first prototype units with packaging in a laboratory environment. • Build and integrate second prototype units. • Start installation engineering prior to testing. <p>FY 2020 Plans:</p> <ul style="list-style-type: none"> • Environment and operability testing. • System Integration. • Build systems for FY 2021 installation. <p>FY 2019 to FY 2020 Increase/Decrease Statement: The decrease of \$11.906 million from FY 2019 to FY 2020 is due to sequencing of prototype development, testing, and purchase of long lead time components.</p>			
<p>Title: Shawshank</p> <p>Description: The Shawshank program provides Special Operations Forces new and enhanced capabilities. Specific applications and detailed plans are available at a higher classification level. The Shawshank program is a new start in FY 2020</p> <p>FY 2020 Plans:</p> <ul style="list-style-type: none"> • Complete engineering feasibility • Complete prototype designs • Build and test models <p>FY 2019 to FY 2020 Increase/Decrease Statement: This is a new start program in FY 2020.</p>		-	-
Title: StormSystem		6.831	5.938

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>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.</p> <p>FY 2019 Plans:</p> <ul style="list-style-type: none"> • Integrate tools into systems. • Begin building prototype infrastructure. • Continue to analyze system performance. <p>FY 2020 Plans:</p> <ul style="list-style-type: none"> • Complete component integration efforts of component tools into systems. • Establish operational beta test capability at transition partner facilities • Analyze system interoperability at operational locations. • Integrate additional gov't systems <p>FY 2019 to FY 2020 Increase/Decrease Statement: The decrease of \$2.982 million from FY 2019 to FY 2020 is due to planned funding for spiral development of the program. Focus for FY 2019 integration efforts of disparate components shifts to infrastructure and full system interoperability during FY 2020. FY 2019 required additional funding to surge integration efforts between disparate components. FY 2020 will complete the outlier components, but primarily focus on the analysis of the system capability and interoperability at the transition partner's location.</p>			
<p>Title: Strike-X</p> <p>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.</p> <p>FY 2019 Plans:</p> <ul style="list-style-type: none"> • Complete test site development activities. • Complete system-level live fire integration and validation engineering tests with demonstrator assets to confirm prototype design. • Conduct and complete system-level prototype demonstration series and evaluate readiness for transition supporting rapid fielding or program of record. • Build and develop prototype systems. <p>FY 2019 to FY 2020 Increase/Decrease Statement:</p>		112.023	46.600
			-

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B. Accomplishments/Planned Programs (\$ in Millions)			FY 2018	FY 2019	FY 2020
Program is complete after FY 2019. No funds are requested in FY 2020.					
<p>Title: Third Eye</p> <p>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.</p> <p>FY 2019 Plans:</p> <ul style="list-style-type: none">• Deploy limited operational capability.• Transition prototype and enhanced capabilities. <p>FY 2020 Plans:</p> <ul style="list-style-type: none">• Continue to update capability based on operator feedback.• Develop limited capability to deploy the target production capability.• Update algorithms and validate through demonstration. <p>FY 2019 to FY 2020 Increase/Decrease Statement:</p> <p>The decrease of \$15.209 million from FY 2019 to FY 2020 is due to a limited capability achieving IOC in FY19 and completing transition. FY 2020 funding supports continued testing and transition for all Uniformed Services.</p>			34.786	25.105	9.896
<p>Title: Vanguard</p> <p>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.</p> <p>FY 2019 Plans:</p> <ul style="list-style-type: none">• Complete prototype design.• Begin iterative test and design phase to achieve full-scale system design.• Field test initial full-scale system. <p>FY 2020 Plans:</p> <ul style="list-style-type: none">• Complete full scale test planning and safety coordination.• Continue to analyze system performance and refinement.• Continue full-scale system test. <p>FY 2019 to FY 2020 Increase/Decrease Statement:</p> <p>The decrease of \$2.985 million from FY 2019 to FY 2020 due to the planned program execution schedule.</p>			8.294	9.416	6.431
Title: Wildcat			-	103.071	178.136

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
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 2019 Plans: <ul style="list-style-type: none"> • Complete artillery designs. • Initiate long lead purchases of hardware. • Conduct initial testing. FY 2020 Plans: <ul style="list-style-type: none"> • Continue testing of components at high setback. • Continue testing component integration. • Conduct initial integration testing. FY 2019 to FY 2020 Increase/Decrease Statement: The increase of \$75.065 million from FY 2019 to FY 2020 is due to moving from design to testing at various ranges and fixing any hardware design issues discovered.			
Title: Hypervelocity Projectile (HVP) Description: These funds were part of the FY 2018 Omnibus Reprogramming action to begin design and fabrication of a custom data-collection projectile that can collect in-bore electromagnetic (EM) flux data on the railgun.		14.000	-
Accomplishments/Planned Programs Subtotals		1,398.221	1,322.687
		FY 2018	FY 2019
Congressional Add: Smarter Machine Learning FY 2018 Accomplishments: FY 2018 Congressional add. FY 2019 Plans: FY 2019 Congressional add.		24.952	24.943
Congressional Add: Quartermaster Pathfinder FY 2019 Plans: FY 2019 Congressional add.		-	39.909
Congressional Adds Subtotals		24.952	64.852
C. Other Program Funding Summary (\$ in Millions)			
N/A			

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C. Other Program Funding Summary (\$ in Millions)		
Remarks		
D. Acquisition Strategy N/A		
E. Performance Metrics Performance metrics are specific to each of the SCO efforts funded under the Advanced Innovative Technologies Program Element. All of which include measures identified in the management approach, Statement of Work (SOW) and Period of Performance (POP). In addition, completions and successes are monitored against schedules and deliverables stated in the initiative's management approach. Due to the nature of these projects, specific applications and detailed plans are available at a higher classification level.		

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense												Date: March 2019			
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Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Alternate Strike	MIPR	Various : Various	198.030	171.508	May 2018	153.033	Mar 2019	34.637	Feb 2020	-		34.637	Continuing	Continuing	-
Angel	C/TBD	Various : Various	-	-		-		95.000	Dec 2019	-		95.000	Continuing	Continuing	-
Aurora	C/TBD	Various : Various	-	-		-		20.000	Dec 2019	-		20.000	Continuing	Continuing	-
Avatar	MIPR	Various : Various	-	24.395	Mar 2018	49.553	Apr 2019	79.172	Dec 2019	-		79.172	Continuing	Continuing	-
Breaker	C/CPFF	Various : Various	-	46.626	Jul 2018	31.635	Jan 2019	44.534	Jan 2020	-		44.534	Continuing	Continuing	-
Carnac	MIPR	Various : Various	-	-		22.016	Jan 2019	22.973	Nov 2019	-		22.973	Continuing	Continuing	-
Chaos	C/TBD	Various : Various	-	-		-		16.000	Dec 2019	-		16.000	Continuing	Continuing	-
C2IE	MIPR	Various : Various	75.002	35.685		24.311		-		-		-	Continuing	Continuing	-
Contender	MIPR	Various : Various	35.550	67.916	Jun 2018	89.363	May 2019	74.521	Nov 2019	-		74.521	Continuing	Continuing	-
Eclipse	C/TBD	Various : Various	-	-		-		25.000	Dec 2019	-		25.000	Continuing	Continuing	-
Enhanced Munitions	MIPR	Various : Various	75.883	29.245	Jan 2018	-		-		-		-	Continuing	Continuing	-
Ghost Fleet	C/Various	Various : Various	-	131.151	Jun 2018	137.426	May 2019	136.940	Nov 2019	-		136.940	Continuing	Continuing	-
HGWS	IA	Various : Various	774.349	65.427	Mar 2018	-		-		-		-	Continuing	Continuing	-
Hoover	MIPR	Various : Various	-	46.000	Jul 2018	74.331	Apr 2019	74.223	Mar 2020	-		74.223	Continuing	Continuing	-
Hornet's Nest	MIPR	Various : Various	-	23.419	May 2018	28.338	Dec 2019	20.783	Mar 2020	-		20.783	Continuing	Continuing	-
Hurt Locker	MIPR	Various : Various	-	56.200	Jul 2018	63.428	Jan 2019	21.772	Jan 2020	-		21.772	Continuing	Continuing	-
Kingfisher	MIPR	Various : Various	-	-		43.508	Jan 2019	76.500	Jan 2020	-		76.500	Continuing	Continuing	-
LiTE Saber	MIPR	Various, TBD : Various	-	63.428	Sep 2018	75.321	Jul 2019	95.006	Oct 2019	-		95.006	Continuing	Continuing	-
Maven	MIPR	Various, TBD : Various	-	15.613	Mar 2018	13.875	Apr 2019	10.886	Mar 2020	-		10.886	Continuing	Continuing	-
Motley Crew	MIPR	Various : Various	-	31.226	May 2018	44.598	Jan 2019	25.731	Jan 2020	-		25.731	Continuing	Continuing	-
Perdix Gen 7	FFRDC	Various : Various	1.600	6.831	Apr 2018	10.902	May 2019	7.917	Jan 2020	-		7.917	Continuing	Continuing	-
Red Dawn	MIPR	Various : Various	-	-		72.479	Feb 2019	8.583	Feb 2020	-		8.583	Continuing	Continuing	-
Sea Dragon	Various	Various : Various	156.051	353.557	Jan 2018	148.659	Jan 2019	46.514	Jan 2020	-		46.514	Continuing	Continuing	-
Sea Mob	MIPR	Various : Various	38.105	9.914	Mar 2018	-		-		-		-	Continuing	Continuing	-
Sea Stalker	MIPR	Various : Various	42.731	26.581	Jun 2018	25.986	Apr 2019	15.835	Jan 2020	-		15.835	Continuing	Continuing	-
Serenity	Various	Various : Various	-	17.565	Jun 2018	20.813	May 2019	8.907	Feb 2020	-		8.907	Continuing	Continuing	-

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense												Date: March 2019			
Appropriation/Budget Activity 0400 / 4						R-1 Program Element (Number/Name) PE 0604250D8Z / <i>Advanced Innovative Technologies</i>				Project (Number/Name) 250 / <i>Advanced Innovative Technologies</i>					
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Shawshank	C/TBD	Various : Various	-	-		-		120.900	Dec 2019	-		120.900	Continuing	Continuing	-
Storm System	Various	Various, TBD : Various	-	6.831	Apr 2018	8.920	Mar 2019	5.938	Apr 2020	-		5.938	Continuing	Continuing	-
Strike-X	MIPR	Various : Various	108.803	112.023	Sep 2018	46.600	Jun 2019	-		-		-	Continuing	Continuing	-
Third Eye	MIPR	Various, TBD : Various	33.810	34.786	May 2018	25.105	May 2019	9.896	Mar 2020	-		9.896	Continuing	Continuing	-
Vanguard	C/Various	Various,TBD : Various	-	8.294	Jun 2018	9.416	Jan 2019	6.431	Dec 2019	-		6.431	Continuing	Continuing	-
Wildcat	MIPR	Various, TBD : Various	-	-		103.071	Jan 2019	178.136	Jan 2020	-		178.136	Continuing	Continuing	-
Smarter Machine Learning	SS/TBD	Various : Various	-	24.952		24.943		-		-		-	Continuing	Continuing	-
Hypervelocity Projectile (HVP)	C/TBD	Various : Various	-	14.000		-		-		-		-	Continuing	Continuing	-
Quartermaster Pathfinder	C/TBD	Various : Various	-	-		39.909		-		-		-	Continuing	Continuing	-
Subtotal			1,539.914	1,423.173		1,387.539		1,282.735		-		1,282.735	Continuing	Continuing	N/A
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			1,539.914	1,423.173		1,387.539		1,282.735		-		1,282.735	Continuing	Continuing	N/A
Remarks															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense										Date: March 2019			
Appropriation/Budget Activity 0400 / 4					R-1 Program Element (Number/Name) PE 0604250D8Z / Advanced Innovative Technologies					Project (Number/Name) 250 / Advanced Innovative Technologies			

	FY 2011				FY 2012				FY 2013				FY 2014				FY 2015				FY 2016				FY 2017			
	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
BREAKER																												
Product Development																												
Contender																												
Product Development																												
HGWS																												
Product Development																												
Perdix Gen 7																												
Product Development																												
Serenity																												
Product Development																												
Alternative Strike																												
Product Development																												
AVATAR																												
Product Development																												
C2IE																												
Product Development																												
Enhanced Munitions																												
Product Development																												
Ghost Fleet																												
Product Development																												
Hornet's Nest																												
Product Development																												
Hurt Locker																												
Product Development																												

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense

Date: March 2019

Appropriation/Budget Activity

0400 / 4

R-1 Program Element (Number/Name)

PE 0604250D8Z / Advanced Innovative Technologies

Project (Number/Name)

250 / Advanced Innovative Technologies

	FY 2011				FY 2012				FY 2013				FY 2014				FY 2015				FY 2016				FY 2017			
	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
LiTE Saber																												
Product Development																												
MAVEN																												
Product Development																												
Motley Crew																												
Product Development																												
Sea Dragon																												
Product Development																												
Sea Mob																												
Product Development																												
Sea Stalker																												
Product Development																												
Storm System																												
Product Development																												
Strike X																												
Product Development																												
Third Eye																												
Product Development																												
Vanguard																												
Product Development																												
Chaos																												
Product Development																												
Aurora																												
Product Development																												
Eclipse																												

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense Date: March 2019

Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604250D8Z / <i>Advanced Innovative Technologies</i>	Project (Number/Name) 250 / <i>Advanced Innovative Technologies</i>
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FY 2011				FY 2012				FY 2013				FY 2014				FY 2015				FY 2016				FY 2017			
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	
Shawshank	
Product Development	

FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
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

BREAKER	
Product Development	
Contender	
Product Development	
HGWS	
Product Development	
Perdix Gen 7	
Product Development	
Serenity	
Product Development	
Alternative Strike	
Product Development	
AVATAR	
Product Development	
C2IE	
Product Development	
Enhanced Munitions	
Product Development	
Ghost Fleet	

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense Date: March 2019

Appropriation/Budget Activity

0400 / 4

R-1 Program Element (Number/Name)

PE 0604250D8Z / Advanced Innovative Technologies

Project (Number/Name)

250 / Advanced Innovative Technologies

	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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																												
Hornet's Nest																												
Product Development																												
Hurt Locker																												
Product Development																												
LiTE Saber																												
Product Development																												
MAVEN																												
Product Development																												
Motley Crew																												
Product Development																												
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Product Development																												
Sea Stalker																												
Product Development																												
Storm System																												
Product Development																												
Strike X																												
Product Development																												
Third Eye																												
Product Development																												
Vanguard																												
Product Development																												

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense																				Date: March 2019																	
Appropriation/Budget Activity 0400 / 4										R-1 Program Element (Number/Name) PE 0604250D8Z / Advanced Innovative Technologies										Project (Number/Name) 250 / Advanced Innovative Technologies																	
										FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
										1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4				
Chaos																																					
Product Development																																					
Aurora																																					
Product Development																																					
Eclipse																																					
Product Development																																					
Shawshank																																					
Product Development																																					

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Office of the Secretary Of Defense			Date: March 2019
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

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
BREAKER				
Product Development	1	2018	4	2020
Contender				
Product Development	1	2017	4	2020
HGWS				
Product Development	1	2017	4	2018
Perdix Gen 7				
Product Development	4	2017	4	2020
Serenity				
Product Development	1	2017	4	2020
Alternative Strike				
Product Development	1	2017	4	2020
AVATAR				
Product Development	1	2018	4	2022
C2IE				
Product Development	4	2017	4	2018
Enhanced Munitions				
Product Development	1	2017	3	2018
Ghost Fleet				
Product Development	1	2018	4	2020
Hornet's Nest				
Product Development	1	2018	2	2020

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Office of the Secretary Of Defense

Date: March 2019

Appropriation/Budget Activity

0400 / 4

R-1 Program Element (Number/Name)

PE 0604250D8Z / Advanced Innovative Technologies

Project (Number/Name)

250 / Advanced Innovative Technologies

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Hurt Locker				
Product Development	2	2018	4	2021
LiTE Saber				
Product Development	1	2017	3	2020
MAVEN				
Product Development	1	2018	3	2020
Motley Crew				
Product Development	1	2018	3	2020
Sea Dragon				
Product Development	1	2017	4	2020
Sea Mob				
Product Development	1	2017	4	2018
Sea Stalker				
Product Development	1	2017	4	2020
Storm System				
Product Development	2	2017	3	2020
Strike X				
Product Development	2	2017	3	2019
Third Eye				
Product Development	2	2017	3	2019
Vanguard				
Product Development	1	2018	3	2020
Chaos				
Product Development	1	2020	4	2022
Aurora				

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Office of the Secretary Of Defense				Date: March 2019	
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	2020	4	2022
Eclipse					
Product Development		1	2020	4	2022
Shawshank					
Product Development		1	2020	4	2022

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: March 2019		
Appropriation/Budget Activity 0400 / 4					R-1 Program Element (Number/Name) PE 0604250D8Z / <i>Advanced Innovative Technologies</i>				Project (Number/Name) 295 / <i>SCO Cyber Efforts</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
295: <i>SCO Cyber Efforts</i>	-	0.000	0.000	30.000	-	30.000	15.000	15.000	15.000	15.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Strategic Capabilities Office (SCO) identifies, analyzes, demonstrates, and transitions game-changing applications of existing and near-term technology (and other U.S. Government capabilities) to shape and counter emerging threats. The SCO combines capability innovation with concepts of operation and information management to develop novel concepts solving critical national security challenges in partnership with the Services, Defense Agencies, Combatant Commands (CCMDS), Joint Chiefs of Staff, Intelligence Community, and the Office of the Secretary of Defense (OSD).

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
<p>Title: Ike</p> <p>Description: The Ike program provides a joint cyber platform. Specific applications and detailed plans are available at a higher classification level. The Ike program is a new start in FY 2020.</p> <p>FY 2020 Plans:</p> <ul style="list-style-type: none"> • Complete architecture design • Integrate collection data • Build and test analysis models <p>FY 2019 to FY 2020 Increase/Decrease Statement:</p> <p>This program is a new start in FY 2020.</p>	0.000	-	30.000
Accomplishments/Planned Programs Subtotals	0.000	-	30.000

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

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics are specific to each of the SCO efforts funded under the Advanced Innovative Technologies Program Element. All of which include measures identified in the management approach, Statement of Work (SOW) and Period of Performance (POP). In addition, completions and successes are monitored against

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: March 2019
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604250D8Z / <i>Advanced Innovative Technologies</i>	Project (Number/Name) 295 / <i>SCO Cyber Efforts</i>

schedules and deliverables stated in the initiative's management approach. Due to the nature of these projects, specific applications and detailed plans are available at a higher classification level.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense												Date: March 2019		
Appropriation/Budget Activity 0400 / 4						R-1 Program Element (Number/Name) PE 0604250D8Z / <i>Advanced Innovative Technologies</i>				Project (Number/Name) 295 / <i>SCO Cyber Efforts</i>				

Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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	
lke	C/TBD	Various : Various	-	-		-		30.000	Dec 2019	-		30.000	Continuing	Continuing	-	
Subtotal			-	-		-		30.000		-		30.000	Continuing	Continuing	N/A	

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total		Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		0.000		30.000		-		30.000	Continuing	Continuing	N/A	

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense										Date: March 2019			
Appropriation/Budget Activity					R-1 Program Element (Number/Name)					Project (Number/Name)			
0400 / 4					PE 0604250D8Z / Advanced Innovative Technologies					295 / SCO Cyber Efforts			

	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Office of the Secretary Of Defense		Date: March 2019
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

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Product Development				
Ike	1	2020	4	2024

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>					R-1 Program Element (Number/Name) PE 0604294D8Z I <i>Trusted and Assured Microelectronics</i>							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	0.000	147.481	522.950	542.421	-	542.421	232.447	244.070	245.624	250.706	Continuing	Continuing
291: <i>Joint Federated Assurance Center</i>	-	0.000	12.000	5.887	-	5.887	6.867	6.844	6.820	6.796	Continuing	Continuing
645: <i>Verification & Validation (V&V) Capabilities and Standards for Trust</i>	0.000	147.481	41.773	39.117	-	39.117	33.686	34.428	34.828	35.854	Continuing	Continuing
646: <i>New Trust Approach Development</i>	0.000	0.000	40.428	38.247	-	38.247	32.870	33.594	34.369	35.056	Continuing	Continuing
647: <i>Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) Innovation and Development</i>	-	0.000	428.749	459.170	-	459.170	159.024	169.204	169.607	173.000	Continuing	Continuing

A. Mission Description and Budget Item Justification

This Program Element (PE) implements, maintains, and updates the DoD's long-term microelectronics strategy and places emphasis on incentivizing and proving new microelectronics technology solutions. In FY 2019 funding for the Joint Federated Assurance Center (JFAC) hardware and software assurance and integrity analysis activities and Microelectronic Innovation for National Security and Economic Competitiveness (MINSEC) activities were reallocated under Project 291 and Project 647, respectively.

This PE supports the 2018 National Defense Strategy's (NDS) line of effort to build a more lethal force through modernization of key capabilities and 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.

Recognizing that a trusted and 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. Its goal is to mitigate the Department of Defense (DoD)'s reliance on sole source foundries for trusted state-of-the-art (SOTA) microelectronics. It supports activities to ensure critical and sensitive integrated circuits are available to meet the DoD's needs. It refines strategies and management planning activities implementing three integrated, complementary solutions that: (1) protect the Intellectual Property (IP) of microelectronics components; (2) improve capabilities to evaluate and validate the trust and assurance of microelectronic parts and advance standards to incentivise the commercial marketplace to recognize hardware assurance as a competitive design standard; (3) develop and demonstrate alternative approaches to the DoD Trusted Foundry program to assure the microelectronics supply chain; and (4) provide

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense				Date: February 2019		
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 0604294D8Z I Trusted and Assured Microelectronics				
access to and leadership in advanced microelectronics that are vital to the national security and economic competitiveness for the USG in order to enable DoD and broader USG access to commercial SOTA microelectronics technology.						
This activity is being led by the Under Secretary of Defense for Research and Engineering. This activity is conducted, in coordination with the JFAC Steering Committee and the Science and Technology (S&T) Advisory Board, by performers, such as the JFAC service providers, Defense Microelectronics Activity (DMEA), the Defense Advanced Research Programs Agency (DARPA), and other DoD and Intelligence Community S&T organizations and laboratories in the area of hardware assurance (HwA) and software assurance (SwA). It is integrating with, and supporting, the functions of the DoD Trusted Foundry Program, the Trusted Supplier accreditation program, JFAC, and related HwA and SwA S&T actions. This activity is also expected to maintain and update the DoD long-term microelectronics strategy based on feedback from the execution of this PE and enable and leverage commercial and academic relationships as necessary to fulfill this mission.						
B. Program Change Summary (\$ in Millions)		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget		83.626	233.142	237.209	-	237.209
Current President's Budget		147.481	522.950	542.421	-	542.421
Total Adjustments		63.855	289.808	305.212	-	305.212
• Congressional General Reductions		-	-			
• Congressional Directed Reductions		-	-			
• Congressional Rescissions		-	-			
• Congressional Adds		66.000	291.000			
• Congressional Directed Transfers		-	-			
• Reprogrammings		-	-			
• SBIR/STTR Transfer		-1.984	-			
• FFRDC Reduction		-0.161	-1.192	-	-	-
• Other Program Adjustments		-	-	-0.675	-	-0.675
• Adjustment for MINSEC Project 647		-	-	302.000	-	302.000
• Adjustment for JFAC Project 291		-	-	3.887	-	3.887
Congressional Add Details (\$ in Millions, and Includes General Reductions)						
Project: 291: Joint Federated Assurance Center				FY 2018	FY 2019	
Congressional Add: Joint Federated Assurance Center				-	10.000	
Congressional Add Subtotals for Project: 291				-	10.000	
Project: 645: Verification & Validation (V&V) Capabilities and Standards for Trust						
Congressional Add: New Trust Approach Development				66.000	-	
Congressional Add Subtotals for Project: 645				66.000	-	

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0604294D8Z I <i>Trusted and Assured Microelectronics</i>
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Congressional Add Details (\$ in Millions, and Includes General Reductions)		FY 2018	FY 2019
Project: 646: <i>New Trust Approach Development</i>			
Congressional Add: <i>New Trust Approach Development</i>		0.000	-
Congressional Add Subtotals for Project: 646		0.000	-
Project: 647: <i>Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) Innovation and Development</i>			
Congressional Add: <i>Next Generation Microelectronics</i>		0.000	281.000
Congressional Add Subtotals for Project: 647		0.000	281.000
Congressional Add Totals for all Projects		66.000	291.000

Change Summary Explanation

FY 2019 funding in the amount of \$291.000 million was added to support acceleration efforts for MINSEC, JFAC, and strategic radiation-hardening activities. In FY 2020, \$302.000 million was added to provide access and assurance to domestic microelectronics production capabilities under Project 647, and \$3.887 million was added to increase JFAC-related efforts under Project 291.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 4					R-1 Program Element (Number/Name) PE 0604294D8Z / <i>Trusted and Assured Microelectronics</i>				Project (Number/Name) 291 / <i>Joint Federated Assurance Center</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
291: <i>Joint Federated Assurance Center</i>	-	0.000	12.000	5.887	-	5.887	6.867	6.844	6.820	6.796	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project funds the operation and software assurance support to DoD programs and organizations of the Joint Federated Assurance Center (JFAC), established in National Defense Authorization Act (NDAA) Sec 937, to increase the DoD's software assurance (SwA) 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 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 available to all DoD programs. JFAC efforts will continue to maintain infrastructure services and staff for the Joint Federated Assurance Center-Coordination Center (JFAC-CC) for enabling the centralized assurance repository, software assurance contract language, software assurance metrics, the JFAC Ticketing System, software assurance tool license distribution, help-desk, and hard problem analysis. It will also provide for implementation of the science and technology portal at the JFAC website to make directly available to programs and organizations advanced technology solutions from Defense Advanced Research Projects Agency (DARPA), Intelligence Advanced Research Projects Agency (IARPA), Defense Innovation Unit (DIU), and Software Engineering Institute (SEI) and other S&T providers.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
Title: Joint Federated Assurance Center (JFAC)	0.000	2.000	5.887
Description: This project's activities will enhance the use of software, hardware, and firmware assurance tools, techniques, and procedures directly with programs and organizations, throughout the life cycle. JFAC provides a common forum in DoD for assurance best practices, community dialog on assurance, access to new technology via the S&T portal, and a ticketing system to connect programs with assurance service providers, ask for hard problem analysis, or just ask for help. In addition, the Assessment Knowledge Base (AKB) will continue to be updated from program comments to retain all program and organization assessment data and a suite of data mining and reporting tools usable by a program throughout the life cycle.			
FY 2019 Plans: <ul style="list-style-type: none"> • Mature JFAC tools, technology and talent capabilities and capacity. • Maintain infrastructure services and staff for the JFAC-CC, enabling the centralized assurance repository, assurance contract language, metrics, SwA tool license distribution, help-desk, and hard problem analysis and provide to all DoD programs and organizations at no cost. • Incorporate S&T, DARPA, IARPA, DIU, and SEI products into the JFAC website for direct access by programs. 			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 4				R-1 Program Element (Number/Name) PE 0604294D8Z / <i>Trusted and Assured Microelectronics</i>				Project (Number/Name) 291 / <i>Joint Federated Assurance Center</i>				
B. Accomplishments/Planned Programs (\$ in Millions)										FY 2018	FY 2019	FY 2020
<ul style="list-style-type: none"> Develop best practices, and relationships with industry. <p>FY 2020 Plans:</p> <ul style="list-style-type: none"> Maintain infrastructure services and staff for the JFAC-CC, enabling the centralized assurance repository, assurance contract language, metrics, SwA tool license distribution, help-desk, and hard problem analysis and provide to all DoD programs and organizations at no cost. Incorporate S&T, DARPA, IARPA, DIU, and SEI products into the JFAC website for direct access by programs. Develop best practices, and relationships with industry. <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding of \$2.000 million transferred from PE 0603826D8Z P826 to PE 0604294D8Z P291 beginning in FY 2019. Increase in FY 2020 supports additional software assurance efforts.</p>												
Accomplishments/Planned Programs Subtotals										0.000	2.000	5.887
										FY 2018	FY 2019	
Congressional Add: Joint Federated Assurance Center										-	10.000	
<p>FY 2019 Plans:</p> <ul style="list-style-type: none"> Expand JFAC capabilities to more effectively identify and mitigate software and hardware cyber security vulnerabilities in DoD weapons systems and networks. Enable JFAC to develop offense-defense interaction analytical capabilities to investigate a variety of threat capabilities and assess resulting system and network vulnerabilities. In a joint service context, enable JFAC to conduct advanced scientific research to identify and mitigate cyber threats to software and hardware in DoD weapons systems and networks. 												
Congressional Adds Subtotals										-	10.000	
C. Other Program Funding Summary (\$ in Millions)												
Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost	
• O&M (CIVPAY): 0303140D8Z	0.000	0.000	1.113	0.000	1.113	1.133	1.156	1.180	1.204	Continuing	Continuing	
Remarks												
D. Acquisition Strategy												
N/A												

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604294D8Z / <i>Trusted and Assured Microelectronics</i>	Project (Number/Name) 291 / <i>Joint Federated Assurance Center</i>

E. Performance Metrics

Performance for this project is monitored in the following ways:

- Increases in throughput in current JFAC service providers, and coordination of the stand-up of additional assurance capability and capacity as Service funding allows.
- Increased Probability of Detection of mission software vulnerabilities.
- Decreased cost to evaluate components.
- Decreased time to evaluate components.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense												Date: February 2019		
Appropriation/Budget Activity 0400 / 4					R-1 Program Element (Number/Name) PE 0604294D8Z / <i>Trusted and Assured Microelectronics</i>					Project (Number/Name) 291 / <i>Joint Federated Assurance Center</i>				

Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Joint Federated Assurance Center	MIPR	Army, Navy, Air Force : Various	-	-		12.000	Jan 2019	5.887	Jan 2020	-		5.887	Continuing	Continuing	2.000
Subtotal			-	-		12.000		5.887		-		5.887	Continuing	Continuing	N/A

	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-	12.000	5.887	-	5.887	Continuing	Continuing	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense										Date: February 2019	
Appropriation/Budget Activity 0400 / 4					R-1 Program Element (Number/Name) PE 0604294D8Z / <i>Trusted and Assured Microelectronics</i>					Project (Number/Name) 291 / <i>Joint Federated Assurance Center</i>	

	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
<i>Joint Federated Assurance Center</i>																												
Mature JFAC tools, technology and talent capabilities and capacity																												
Maintain infrastructure services and staff																												
Incorporate science and technology, advanced technology solutions into the JFAC website																												
Develop best practices, and relationships with industry																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Office of the Secretary Of Defense			Date: February 2019
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604294D8Z / <i>Trusted and Assured Microelectronics</i>	Project (Number/Name) 291 / <i>Joint Federated Assurance Center</i>	

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>Joint Federated Assurance Center</i>				
Mature JFAC tools, technology and talent capabilities and capacity	2	2020	4	2020
Maintain infrastructure services and staff	2	2020	3	2024
Incorporate science and technology, advanced technology solutions into the JFAC website	2	2020	3	2024
Develop best practices, and relationships with industry	2	2020	3	2024

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 4					R-1 Program Element (Number/Name) PE 0604294D8Z / <i>Trusted and Assured Microelectronics</i>				Project (Number/Name) 645 / <i>Verification & Validation (V&V) Capabilities and Standards for Trust</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
645: <i>Verification & Validation (V&V) Capabilities and Standards for Trust</i>	0.000	147.481	41.773	39.117	-	39.117	33.686	34.428	34.828	35.854	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project improves microelectronics test and verification methodologies in support of 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 when DoD Trusted Foundry Program options are not available. Core technical laboratories and other HwA and SwA capabilities are chartered as a JFAC to provide this support. 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 (<45 nanometers (nm)), throughput/time required for analysis, ability to analyze third-party 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, in coordination with the JFAC, which prioritizes this investment as required to meet the realized and projected out-year demand for JFAC 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.

This project develops and matures assurance mitigations, evaluates the effectiveness of protections of IP in support of 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, and system vulnerability assessments and testbeds.

This project also develops standards and practices in support of assured designs and supply chains and formal relationships with industry to foster commercial development of secure, trusted, and assured parts and for acquisition of USG access to proprietary designs, software, development, and quality assurance processes and test procedures to develop practices that minimize security flaws in designs and facilitate verification. Two capability areas that are core to improved commercial designs will be improved, i.e., assured designs and supply chains.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
Title: Verification & Validation (V&V) Capabilities and Standards for Trust	40.449	41.773	39.117

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604294D8Z / <i>Trusted and Assured Microelectronics</i>	Project (Number/Name) 645 / <i>Verification & Validation (V&V) Capabilities and Standards for Trust</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>Description: The JFAC will: (1) improve its microelectronics test and verification methodologies in support of verifying trust and assurance of parts and (2) develop standards/practices to foster commercial development of secure, trusted and assured parts.</p> <p>FY 2019 Plans: Verification and test technologies activities will include:</p> <ul style="list-style-type: none"> • Improvements to the core JFAC's (1) technical capability, through the procurement of laboratory equipment, IP, analysis tools, such as imaging software, and highly skilled tradecraft, and (2) capacity to perform microelectronics assessments. FY 2019 and out-year demands will require an increase in capacity supporting weapon system program engagement, which will take the form of additional personnel and/or equipment to permit scaling of assessment capabilities. • Testing in support of radiation hardened by design (RHBD) and radiation hardened by process (RHBP) initiatives. • Strategic radiation hardened electronics council (SRHEC) coordination. • Strategic radiation support of radio frequency and optoelectronic devices. • Enhancement of automation and standard processes needed to increase the throughput of information produced by individual JFAC laboratory tools as well as to facilitate information sharing across the families of tools used for analysis and testing. • Research into qualification concerns regarding strategic radiation hardened parts from state of the art (SOTA) and state of the practice (SOTP) foundries. • Development of common subject matter expert (SME) training and protocols based on the existing tool base, to include both commercial and USG-developed tools. • Funding for additional SME support in each core laboratory in support of the microelectronics trust verification and other JFAC-related work. • Increased direct program support focused on addressing technical gaps and assurance-related findings. <p>Standards and practices activities will include:</p> <ul style="list-style-type: none"> • Development of standards and best practices, and relationships with industry, to foster commercial development of secure, trusted and assured parts. • Establishment of formal relationships with FPGA vendors and other key commercial suppliers to improve device and IP security. • Acquisition of USG access to proprietary designs, software, development, and quality assurance processes and test procedures to develop design practices that minimize security flaws and facilitate verification. • Establishment of USG and industry working groups to develop test procedures to validate the assurance of designs. • Documentation and promulgation of security-enhancing design practices across the USG, industry, and academia. • Development of industry-wide standards and practices to establish a common understanding of what constitutes assured hardware, software, and firmware at both the component and system level. 			
			FY 2020

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense			Date: February 2019		
Appropriation/Budget Activity 0400 / 4		R-1 Program Element (Number/Name) PE 0604294D8Z / <i>Trusted and Assured Microelectronics</i>		Project (Number/Name) 645 / <i>Verification & Validation (V&V) Capabilities and Standards for Trust</i>	
B. Accomplishments/Planned Programs (\$ in Millions)			FY 2018	FY 2019	FY 2020
<ul style="list-style-type: none"> • Development of a common lexicon for secure hardware, software, and firmware in collaboration with the Committee for National Security Systems, National Institute of Standards and Technology, and the broader USG, industry, and academia. • Definition of supply chain controls for assured chain of custody for critical and other microelectronics devices and IP. • Development of security training and education of USG and industry system security engineers and material managers on supply chain and life-cycle management best practices using agreed-upon language, standards, and practices. • Alignment of 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), and industry standards identifying and addressing gaps in definition and criteria and establishing accepted levels of supplier and part assurance. <p>FY 2020 Plans:</p> <p>Continuation of FY 2019 verification and test technologies activities including:</p> <ul style="list-style-type: none"> • Improvements to the core JFAC's (1) technical capability, through the procurement of laboratory equipment, IP, analysis tools, such as imaging software, and highly skilled tradecraft, and (2) capacity to perform microelectronics assessments. FY 2019 and out-year demands will require an increase in capacity supporting weapon system program engagement, which will take the form of additional personnel and/or equipment to permit scaling of assessment capabilities. • Testing in support of radiation hardened by design (RHBD) and radiation hardened by process (RHBP) initiatives. • Strategic radiation hardened electronics council (SRHEC) coordination. • Strategic radiation support of radio frequency and optoelectronic devices. • Enhancement of automation and standard processes needed to increase the throughput of information produced by individual JFAC laboratory tools as well as to facilitate information sharing across the families of tools used for analysis and testing. • Research into qualification concerns regarding strategic radiation hardened parts from state of the art (SOTA) and state of the practice (SOTP) foundries. • Development of common subject matter expert (SME) training and protocols based on the existing tool base, to include both commercial and USG-developed tools. • Funding for additional SME support in each core laboratory in support of the microelectronics trust verification and other JFAC-related work. • Increased direct program support focused on addressing technical gaps and assurance-related findings. <p>Continuation of FY 2019 standards and practices activities including:</p> <ul style="list-style-type: none"> • Development of standards and best practices, and relationships with industry, to foster commercial development of secure, trusted and assured parts. • Establishment of formal relationships with FPGA vendors and other key commercial suppliers to improve device and IP security. 					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense			Date: February 2019		
Appropriation/Budget Activity 0400 / 4		R-1 Program Element (Number/Name) PE 0604294D8Z / <i>Trusted and Assured Microelectronics</i>		Project (Number/Name) 645 / <i>Verification & Validation (V&V) Capabilities and Standards for Trust</i>	
B. Accomplishments/Planned Programs (\$ in Millions)			FY 2018	FY 2019	FY 2020
<ul style="list-style-type: none"> • Acquisition of USG access to proprietary designs, hardware, software, development, and quality assurance processes and test procedures to develop design practices that minimize security flaws and facilitate verification. • Establishment of USG and industry working groups to develop test procedures to validate the assurance of designs. • Documentation and promulgation of security-enhancing design practices across the USG, industry, and academia. • Development of industry-wide standards and practices to establish a common understanding of what constitutes assured hardware, software, and firmware at both the component and system level. • Development of a common lexicon for secure hardware, software, and firmware in collaboration with the Committee for National Security Systems, National Institute of Standards and Technology, and the broader USG, industry, and academia. • Definition of supply chain controls for assured chain of custody for critical and other microelectronics devices and IP. • Development of security training and education of USG and industry system security engineers and material managers on supply chain and life-cycle management best practices using agreed-upon language, standards, and practices. • Alignment of 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., NIST 800-161 (Supply Chain Risk Management Practices for Federal Information Systems and Organizations), and industry standards identifying and addressing gaps in definition and criteria and establishing accepted levels of supplier and part assurance. <p>FY 2019 to FY 2020 Increase/Decrease Statement: Level of effort is consistent between FY 2019 and FY 2020. Small changes reflect minor budget fluctuations.</p>					
<p>Title: New Trust Approach Development</p> <p>Description: This project's activities will mature and evaluate 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.</p> <p>In addition, the JFAC will initiate the conduct of identified acquisition program pilots and technology demonstrations in coordination with research programs across government R&D organizations, academia and industry.</p> <p>Note: Execution of these funds in FY 2018 is under project code 646.</p>			41.032	-	-
Accomplishments/Planned Programs Subtotals			81.481	41.773	39.117
			FY 2018	FY 2019	
Congressional Add: New Trust Approach Development			66.000	-	

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019									
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604294D8Z / <i>Trusted and Assured Microelectronics</i>	Project (Number/Name) 645 / <i>Verification & Validation (V&V) Capabilities and Standards for Trust</i>									
		<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td style="width:50%;"></td> <td style="width:25%; text-align: center;">FY 2018</td> <td style="width:25%; text-align: center;">FY 2019</td> </tr> <tr> <td> <i>FY 2018 Accomplishments:</i> • Initiated development of an advanced technology center for next-generation artificial intelligence systems including standing up an intellectual property library. • Initiated modernization enhancements for 90 nanometer (nm) to 65nm/45nm radiation-hardened semiconductor fabrication at a government foundry. • Purchased and began installation of an electron-beam lithography tool at a government laboratory. • Evaluated state-of-the-art integrated chip (processor) for use in real-world DoD and other agency applications. • Awarded contract for advanced prototype development project using complementary metal oxide semiconductor photo diode arrays in collaboration with two commercial foundries. Note: Execution of these funds in FY 2018 is under project code 646. </td> <td></td> <td></td> </tr> <tr> <td align="right">Congressional Adds Subtotals</td> <td align="center">66.000</td> <td align="center">-</td> </tr> </table>		FY 2018	FY 2019	<i>FY 2018 Accomplishments:</i> • Initiated development of an advanced technology center for next-generation artificial intelligence systems including standing up an intellectual property library. • Initiated modernization enhancements for 90 nanometer (nm) to 65nm/45nm radiation-hardened semiconductor fabrication at a government foundry. • Purchased and began installation of an electron-beam lithography tool at a government laboratory. • Evaluated state-of-the-art integrated chip (processor) for use in real-world DoD and other agency applications. • Awarded contract for advanced prototype development project using complementary metal oxide semiconductor photo diode arrays in collaboration with two commercial foundries. Note: Execution of these funds in FY 2018 is under project code 646.			Congressional Adds Subtotals	66.000	-
	FY 2018	FY 2019									
<i>FY 2018 Accomplishments:</i> • Initiated development of an advanced technology center for next-generation artificial intelligence systems including standing up an intellectual property library. • Initiated modernization enhancements for 90 nanometer (nm) to 65nm/45nm radiation-hardened semiconductor fabrication at a government foundry. • Purchased and began installation of an electron-beam lithography tool at a government laboratory. • Evaluated state-of-the-art integrated chip (processor) for use in real-world DoD and other agency applications. • Awarded contract for advanced prototype development project using complementary metal oxide semiconductor photo diode arrays in collaboration with two commercial foundries. Note: Execution of these funds in FY 2018 is under project code 646.											
Congressional Adds Subtotals	66.000	-									
<u>C. Other Program Funding Summary (\$ in Millions)</u> N/A <u>Remarks</u> N/A <u>D. Acquisition Strategy</u> NA <u>E. Performance Metrics</u> Performance for this project is monitored in the following ways: • Increases in throughput in current JFAC laboratories, and stand-up of additional capability and capacity as required, so that at least two laboratories will have capability in physical verification, functional analysis, and design verification to increase the DoD's overall microelectronics trust verification and test capacity for analysis of parts. • Increased Probability of Detection of malicious insertion and/or counterfeit parts. • Decreased cost to evaluate components. • Decreased time to evaluate components.											

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense												Date: February 2019		
Appropriation/Budget Activity 0400 / 4						R-1 Program Element (Number/Name) PE 0604294D8Z / <i>Trusted and Assured Microelectronics</i>				Project (Number/Name) 645 / <i>Verification & Validation (V&V) Capabilities and Standards for Trust</i>				

Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
V&V Capabilities and Standards for Trust	MIPR	Various (Air Force, Army, Navy, NSA) : Various	-	147.481	Mar 2018	41.773	Mar 2019	39.117	Mar 2020	-		39.117	Continuing	Continuing	-
Subtotal			-	147.481		41.773		39.117		-		39.117	Continuing	Continuing	N/A

Remarks N/A															
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	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	147.481		41.773		39.117		-		39.117	Continuing	Continuing	N/A

Remarks NA															
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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense			Date: February 2019
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604294D8Z / <i>Trusted and Assured Microelectronics</i>	Project (Number/Name) 645 / <i>Verification & Validation (V&V) Capabilities and Standards for Trust</i>	

	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
<i>V&V Capabilities and Standards for Trust</i>																												
Joint Federated Assurance Center (JFAC) Hardware Assurance (HwA) Technical Working Group Support																												
JFAC Capability Enhancement (equipment and intellectual property procurement)																												
JFAC Subject Matter Expert (SME) Training and Development																												
JFAC Direct Program Support																												
Radiation Training in Support of RHBD and RHBP Initiatives																												
SRHEC Coordination																												
Strategic Radiation Support of Rapid Fielding Optoelectronic Devices																												
Microelectronics Assurance and Supply Chain Standards and Best Practices Development																												
U.S. Government and Industry Engagement																												
Microelectronics Assurance and Supply Chain Training for U.S. Government and Industry																												
Microelectronics Assurance and Supply Chain Policy and Guidance Development/ Update																												
Management/Technical Support																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Office of the Secretary Of Defense			Date: February 2019
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604294D8Z / <i>Trusted and Assured Microelectronics</i>	Project (Number/Name) 645 / <i>Verification & Validation (V&V) Capabilities and Standards for Trust</i>	

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>V&V Capabilities and Standards for Trust</i>				
Joint Federated Assurance Center (JFAC) Hardware Assurance (HwA) Technical Working Group Support	1	2020	4	2024
JFAC Capability Enhancement (equipment and intellectual property procurement)	1	2020	4	2024
JFAC Subject Matter Expert (SME) Training and Development	1	2020	4	2024
JFAC Direct Program Support	1	2020	4	2024
Radiation Training in Support of RHBD and RHBP Initiatives	1	2020	4	2024
SRHEC Coordination	1	2020	4	2024
Strategic Radiation Support of Rapid Fielding Optoelectronic Devices	1	2020	4	2024
Microelectronics Assurance and Supply Chain Standards and Best Practices Development	1	2020	4	2024
U.S. Government and Industry Engagement	1	2020	4	2024
Microelectronics Assurance and Supply Chain Training for U.S. Government and Industry	1	2020	4	2024
Microelectronics Assurance and Supply Chain Policy and Guidance Development/Update	1	2020	4	2024
Management/Technical Support	1	2020	4	2024

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 4					R-1 Program Element (Number/Name) PE 0604294D8Z / <i>Trusted and Assured Microelectronics</i>				Project (Number/Name) 646 / <i>New Trust Approach Development</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
646: <i>New Trust Approach Development</i>	0.000	0.000	40.428	38.247	-	38.247	32.870	33.594	34.369	35.056	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project funds a program of research to develop the next generation, technology-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 intellectual property (IP) from exploitation. It is also intended to dramatically improve the capabilities of the JFAC with regard to verification and validation of SOTA microelectronics assurance.

This program of research will develop 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 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 and independent verification and validation of commercial designs. It also develops, demonstrates, and implements 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 where 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 trusted environments. The project would also support using a repository of vetted third-party IP and electronic data automation (EDA) tools to expedite circuit design and transition promising technologies to use.

This project initially received additional funding in FY 2019 to support Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) efforts in the following focus areas: capture and secure microelectronics R&D; new microelectronics development, demonstration, and capability insertion; 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 Project Number 646 to Project Number 647.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604294D8Z / <i>Trusted and Assured Microelectronics</i>	Project (Number/Name) 646 / <i>New Trust Approach Development</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<p>Title: New Trust Approach Development</p> <p>Description: This project's activities will mature and evaluate 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.</p> <p>In addition, the JFAC will initiate the conduct of identified acquisition program pilots and technology demonstrations in coordination with research programs across government R&D organizations, academia and industry.</p> <p>FY 2019 Plans: This project will engage early on with potential stakeholders to identify potential transition issues and aid in transition through joint collaboration between research teams and stakeholders with a focus on evaluations of prototypes, test articles and beta versions of tools, IP, techniques, methods, etc. and their use in operationally-realistic scenarios.</p> <p>Primary efforts will include the following:</p> <ul style="list-style-type: none"> • Reducing-to-practice technologies enabling assured (1) design, (2) access, (3) component integrity and (4) IP protection. • Assured design demonstration and evaluation. • Systems security analysis for assurance of microelectronics in DoD missions. • Analog test chip fabrication. • Advanced chip interconnection development to eliminate wire bonding and improve functional performance. • Printed circuit board (PrCB) design confirmation tool development. • Application-specific integrated circuit (ASIC) netlist analysis capability development. • Field programmable gate array (FPGA) analyses tool development. • Identification of non-invasive measurement techniques at the die/wafer level to provide increased hardware assurance. <p>Primary activities in FY 2019 will continue the development of these technologies, followed by transition of these capabilities to new programs in the fiscal years that follow under PE 0605294D8Z.</p> <p>FY 2020 Plans: Continuation of FY 2019 activities including the following:</p> <ul style="list-style-type: none"> • Reducing-to-practice technologies enabling assured (1) design, (2) access, (3) component integrity and (4) IP protection. • Assured design demonstration and evaluation. • Systems security analysis for assurance of microelectronics in DoD missions. 		0.000	40.428	38.247

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604294D8Z / <i>Trusted and Assured Microelectronics</i>	Project (Number/Name) 646 / <i>New Trust Approach Development</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<ul style="list-style-type: none"> • Analog test chip fabrication. • Advanced chip interconnection development to eliminate wire bonding and improve functional performance. • Printed circuit board (PrCB) design confirmation tool development. • Application-specific integrated circuit (ASIC) netlist analysis capability development. • Field programmable gate array (FPGA) analyses tool development. • Identification of non-invasive measurement techniques at the die/wafer level to provide increased hardware assurance. 			
FY 2019 to FY 2020 Increase/Decrease Statement: In FY 2019, funding for MINSEC activities was re-allocated from Project Number 646 to Project Number 647.			
Accomplishments/Planned Programs Subtotals		0.000	40.428
	FY 2018	FY 2019	
Congressional Add: New Trust Approach Development	0.000	-	
FY 2018 Accomplishments: <ul style="list-style-type: none"> • Initiated development of an advanced technology center for next-generation artificial intelligence systems including standing up an intellectual property library. • Initiated modernization enhancements for 90 nanometer (nm) to 65nm/45nm radiation-hardened semiconductor fabrication at a government foundry. • Purchased and began installation of an electron-beam lithography tool at a government laboratory. • Evaluated state-of-the-art integrated chip (processor) for use in real-world DoD and other agency applications. • Awarded contract for advanced prototype development project using complementary metal oxide semiconductor photo diode arrays in collaboration with two commercial foundries. 			
Congressional Adds Subtotals	0.000	-	
C. Other Program Funding Summary (\$ in Millions)			
N/A			
Remarks			
N/A			
D. Acquisition Strategy			
N/A			
E. Performance Metrics			
Performance for this project is monitored in the following ways:			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604294D8Z / <i>Trusted and Assured Microelectronics</i>	Project (Number/Name) 646 / <i>New Trust Approach Development</i>
<ul style="list-style-type: none"> • Enhanced capability in physical verification, functional analysis, and design verification. • Increased Probability of Detection of malicious insertion and/or counterfeit parts. • Effectiveness of developed technologies, as measured by: <ul style="list-style-type: none"> - The speed and reliability of new validation and verification techniques in identifying known microelectronics issues (e.g., tampering) in laboratory and non-laboratory situations. - Successful demonstration of advanced, alternative manufacturing techniques, such as disaggregated manufacturing. - Resilience of microelectronics protected by new trust approach technologies in red teaming exercises. • Adoption of next-generation commercial technologies, as measured by: <ul style="list-style-type: none"> - The number of DoD and other USG programs employing assured access to SOTP and SOTA technologies, design approaches, and best practices developed in cooperation with commercial partners. - The volume and criticality of components employing these technologies, design approaches, or best practices. - Promulgation in DoD guidance and program protection plans. • Commercial partnerships established for, or enhanced by, the development and manufacture of DoD microelectronics using next-generation assurance technologies. 		

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense												Date: February 2019		
Appropriation/Budget Activity 0400 / 4					R-1 Program Element (Number/Name) PE 0604294D8Z / <i>Trusted and Assured Microelectronics</i>					Project (Number/Name) 646 / <i>New Trust Approach Development</i>				

Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
New Trust Approach Development	MIPR	Various (DARPA, Air Force, Army, Navy, NSA) : Various	-	0.000		40.428	Mar 2019	38.247	Mar 2020	-		38.247	Continuing	Continuing	-
Subtotal			-	0.000		40.428		38.247		-		38.247	Continuing	Continuing	N/A

	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	0.000	40.428	38.247	-	38.247	Continuing	Continuing	N/A

Remarks
NA

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense										Date: February 2019			
Appropriation/Budget Activity 0400 / 4					R-1 Program Element (Number/Name) PE 0604294D8Z / <i>Trusted and Assured Microelectronics</i>					Project (Number/Name) 646 / <i>New Trust Approach Development</i>			

	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
<i>New Trust Approach Development</i>																												
Third Party Intellectual Property (IP) and EDA tool repository development																												
ASIC netlist analysis capability development																												
Field programmable gate array (FPGA) analyses tool development																												
Microelectronics assurance and supply chain technology maturation																												
Assured design demonstration and evaluation																												
Government and industry engagement																												
Microelectronics assurance and supply chain policy and guidance development/update																												
Management/Technical Support																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Office of the Secretary Of Defense			Date: February 2019
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604294D8Z / <i>Trusted and Assured Microelectronics</i>	Project (Number/Name) 646 / <i>New Trust Approach Development</i>	

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>New Trust Approach Development</i>				
Third Party Intellectual Property (IP) and EDA tool repository development	1	2020	4	2023
ASIC netlist analysis capability development	1	2020	4	2024
Field programmable gate array (FPGA) analyses tool development	1	2020	4	2024
Microelectronics assurance and supply chain technology maturation	1	2020	4	2024
Assured design demonstration and evaluation	1	2020	4	2024
Government and industry engagement	1	2020	4	2024
Microelectronics assurance and supply chain policy and guidance development/update	1	2020	4	2024
Management/Technical Support	1	2020	4	2024

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 4					R-1 Program Element (Number/Name) PE 0604294D8Z / <i>Trusted and Assured Microelectronics</i>				Project (Number/Name) 647 / <i>Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) Innovation and Development</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
647: <i>Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) Innovation and Development</i>	-	0.000	428.749	459.170	-	459.170	159.024	169.204	169.607	173.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project supports the DoD microelectronics strategy by ensuring the availability of and access to the advanced, assured microelectronics that are critical for DoD and national security systems. It will support the development and delivery of tools to protect the intellectual property (IP) confidentiality and integrity for a broad range of systems and missions and will provide a path for the production of these articles. It will allow the DoD to 1) maintain technological leadership and a secure domestic microelectronics ecosystem; 2) promote access to all necessary current and future semiconductor technologies, including design, fabrication, packaging, and testing, from a robust base of suppliers; 3) provide multiple options for programs and the defense industrial base to quickly upgrade microelectronic components; 4) 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 deliver new capabilities in artificial intelligence (AI) processors, co-development of advanced commercial-off-the-shelf (COTS) programmable devices, and addressing select IP obsolescence risks; and 5) 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 state-of-the-art (SOTA) technology; 2) enhancing state-of-the-practice (SOTP) foundries in the U.S. to produce more advanced technologies to better serve low-volume customers in the aerospace and defense community; 3) investing in research and development (R&D) for the next generation of microelectronics for new materials, devices, architectures, and designs in coordination with the Defense Advanced Research Projects Agency (DARPA) Electronics Resurgence Initiative (ERI); 4) promoting threat awareness, proactive protection, and supply chain security to ensure these investments continue to benefit the U.S.; 5) exploring incentives for market growth through dual-use technologies, piloting acquisition reforms, partnering with industry, and providing incentives for cooperative R&D and trade; and (6) establishing innovation hub pilots with industry.

MINSEC activities are categorized into the following focus areas: next generation disruptive R&D; capture and secure microelectronics R&D; new microelectronics development, demonstration, and capability insertion; COTS programmable integrated circuit (IC) co-development; microelectronics obsolescence and replacement; microelectronics-focused workforce development; radiation hardening by process (RHBP) and radiation hardening by design (RHBD); and radio frequency (RF) and optoelectronic (OE) microelectronics.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
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		
This project has received funding in FY 2020 to support MINSEC efforts in the following focus areas: capture and secure microelectronics R&D; new microelectronics development, demonstration, and capability insertion; RHBP and RHBD; and RF and OE microelectronics.				
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
Title: Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC)		0.000	147.749	459.170
Description: This project’s activities will mature and evaluate microelectronics 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.				
FY 2019 Plans: This project will initiate and support R&D activities in each of the following technical focus areas:				
• Capture and secure microelectronics R&D, including support and enhanced manufacturing at SOTP foundries.				
• New microelectronics development, demonstration, and capability insertion including supporting public/private co-development of new COTS programmable devices that address USG needs during their development by industry when it is the most cost-effective to do so.				
• RHBP and RHBD including supporting secure design of RHBD IP in all major domestic foundries and fabrication of SOTA test articles for evaluation and qualification.				
• RF and optoelectronics including supporting secure design of IP and access to SOTP government and commercial facilities for RF and optical devices.				
FY 2020 Plans: This project will continue FY 2019 R&D activities in each of the following technical focus areas:				
• Capture and secure microelectronics R&D, including support and enhanced manufacturing at SOTP foundries.				
• New microelectronics development, demonstration, and capability insertion including supporting public/private co-development of new COTS programmable devices that address USG needs during their development by industry when it is the most cost-effective to do so.				
• RHBP and RHBD including supporting secure design of RHBD IP in all major domestic foundries and fabrication of SOTA test articles for evaluation and qualification.				
• RF and OE microelectronics including supporting secure design of IP and access to SOTP government and commercial facilities for RF and OE devices.				
• Establish partnerships with industry for the following activities:				

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense			Date: February 2019		
Appropriation/Budget Activity 0400 / 4		R-1 Program Element (Number/Name) PE 0604294D8Z / <i>Trusted and Assured Microelectronics</i>	Project (Number/Name) 647 / <i>Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) Innovation and Development</i>		
B. Accomplishments/Planned Programs (\$ in Millions)			FY 2018	FY 2019	FY 2020
<ul style="list-style-type: none">• Joint development of assured fifth-generation (5G) and internet of things (IoT) network, 5G modems, and end-user devices using assured design and fabrication processes;• Assured access to commercial foundry capabilities and products using assured design and fabrication processes and standards;• Joint development of assured processes and access to domestic assured memory with co-development of processing near-memory architectures and 3D integration for artificial intelligence and vision processing applications;• Assurance pilot with state-of-the-art foundry to adopt new assurance standards and methods to allow processing of U.S. government and critical commercial wafers in an assured commercial flow. <p>This project will engage early on with potential stakeholders to identify potential transition issues and aid in transition through joint collaboration between research teams and stakeholders with a focus on evaluations of prototypes, test articles, and beta versions of tools, IP, techniques, methods, etc. and their use in operationally-realistic scenarios.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Prior the start of FY 2019, MINSEC activities were planned to be funded in Project Number 646. The funding for those MINSEC activities was subsequently reallocated to Project Number 647 during the first month of FY 2019. Level of effort is consistent between FY 2019 (including the congressional add) and FY 2020.</p>					
Accomplishments/Planned Programs Subtotals			0.000	147.749	459.170
			FY 2018	FY 2019	
Congressional Add: Next Generation Microelectronics			0.000	281.000	
FY 2018 Accomplishments: N/A					
FY 2019 Plans: This project will use the Congressional Add funding in FY 2019 to support the following MINSEC activities:					
<ul style="list-style-type: none">• Continue development of an advanced technology center for next-generation artificial intelligence systems.• Continue modernization enhancements for 90 nanometer (nm) to 65nm/45nm radiation-hardened semiconductor fabrication.• Provide robust access to advanced node foundry production and R&D processes and fully leverage the multiple domestic R&D facilities for DoD and national needs.• Deliver multiple secure design environments into industry, academia, and government to capture intellectual property (IP) and architectures and IP sharing and re-use.					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604294D8Z / <i>Trusted and Assured Microelectronics</i>	Project (Number/Name) 647 / <i>Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) Innovation and Development</i>

	FY 2018	FY 2019
<ul style="list-style-type: none"> • Accelerate radiation-hardened processor design. • Continue development and expand deployment of a secure cloud environment and secure supply chain life cycle ecosystem. 		
Congressional Adds Subtotals	0.000	281.000

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

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance for this project is monitored in the following ways:

- Expanded access to leading SOTA technology and enhanced availability of essential SOTP design and fabrication capabilities.
- Successful transition demonstrations from commercial technology to modernized military applications, e.g., such as secure design environment suites and strategic radiation-hardened and RF-optical microelectronics.
- Successful development of new COTS devices including system-on-chip (SoC).
- Successful development of secure RHBP intellectual property in a major domestic foundry and enhanced manufacturing of integrated chips for evaluation and qualification.
- Successful development of RF and optoelectronic IP and test articles.
- Adoption of next-generation commercial technologies, as measured by:
 - The number of DoD and other USG programs employing assured access to SOTP and SOTA technologies, design approaches, and best practices developed in cooperation with commercial partners.
 - The volume and criticality of components employing these technologies, design approaches, or best practices.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense												Date: February 2019			
Appropriation/Budget Activity 0400 / 4				R-1 Program Element (Number/Name) PE 0604294D8Z / <i>Trusted and Assured Microelectronics</i>				Project (Number/Name) 647 / <i>Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) Innovation and Development</i>							

Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) Innovation and Development	MIPR	DARPA, Air Force, Army, Navy, NSA : Various	-	-		428.749	Mar 2019	459.170	Mar 2020	-		459.170	Continuing	Continuing	-
Subtotal			-	-		428.749		459.170		-		459.170	Continuing	Continuing	N/A

	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-	428.749	459.170	-	459.170	Continuing	Continuing	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense			Date: February 2019
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604294D8Z / <i>Trusted and Assured Microelectronics</i>	Project (Number/Name) 647 / <i>Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) Innovation and Development</i>	

	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
<i>MINSEC Innovation and Development</i>																												
Capture and secure microelectronics R&D																												
New microelectronics development, demonstration, and capability insertion																												
Radiation hardening by process and radiation hardening by design development activities																												
Radio frequency (RF) and optoelectronics development activities																												
Government and industry engagement																												
Microelectronics assurance and supply chain policy and guidance development/update																												
Management/Technical Support																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Office of the Secretary Of Defense			Date: February 2019
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604294D8Z / <i>Trusted and Assured Microelectronics</i>	Project (Number/Name) 647 / <i>Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) Innovation and Development</i>	

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>MINSEC Innovation and Development</i>				
Capture and secure microelectronics R&D	1	2020	4	2024
New microelectronics development, demonstration, and capability insertion	1	2020	4	2024
Radiation hardening by process and radiation hardening by design development activities	1	2020	4	2024
Radio frequency (RF) and optoelectronics development activities	1	2020	4	2024
Government and industry engagement	1	2020	4	2024
Microelectronics assurance and supply chain policy and guidance development/update	1	2020	4	2024
Management/Technical Support	1	2020	4	2024

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity	R-1 Program Element (Number/Name)											
0400: Research, Development, Test & Evaluation, Defense-Wide / BA 4: Advanced Component Development & Prototypes (ACD&P)	PE 0604331D8Z / Rapid Prototyping Program											
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	100.000	46.984	99.107	100.957	-	100.957	102.964	104.961	106.972	109.241	Continuing	Continuing
638: Rapid Prototyping Program	100.000	46.984	99.107	100.957	-	100.957	102.964	104.961	106.972	109.241	Continuing	Continuing

A. Mission Description and Budget Item Justification

The Rapid Prototyping Program (RPP) accelerates innovation through prototyping efforts in partnership with the Services and Defense Agencies that reduce risk, establish affordable and realistic requirements, and support timely development of fieldable prototypes demonstrated in an operational environment. RPP addresses priorities identified by the National Defense Strategy, modernization focus areas of the Department of Defense (DoD), the Chairman's Capability Gap Assessment, and Service-identified capability gaps and needs. Overarching program goals include enhanced warfighter lethality, modernization of cross-cutting technology areas, and delivering capabilities more quickly than traditional acquisition.

RPP develops prototypes that deliver needed capabilities to address Service gaps, reduce technical and integration risk, and enable warfighter feedback to define and improve requirements for Service and Agency programs of record. RPP project selection is guided by the National Defense Strategy, USD(R&E) priorities, and key technology modernization areas including machine learning; directed energy, networked command, control, and communications, intelligence, surveillance, and reconnaissance (ISR), advanced autonomous systems, and, joint lethality. RPP is also guided by the Chairman's Capability Gap Assessment, and Service-identified gaps and needs. RPP rapidly develops and fields cross-cutting, multi-Service prototype capabilities that can be demonstrated in an operational environment to inform Department of Defense and Service leadership.

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	100.000	99.333	101.246	-	101.246
Current President's Budget	46.984	99.107	100.957	-	100.957
Total Adjustments	-53.016	-0.226	-0.289	-	-0.289
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-2.920	-			
• Congressional Reduction	-50.000	-	-	-	-
• FFRDC Reduction	-0.096	-0.226	-	-	-
• Other Program Adjustments	-	-	-0.289	-	-0.289

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide</i> / BA 4: <i>Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0604331D8Z / <i>Rapid Prototyping Program</i>	
<p><u>Change Summary Explanation</u></p> <p>The Congressional reduction in FY 2018 recognizes that the Rapid Prototyping Program was a new initiative starting in late FY 2017.</p>		

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
638: Rapid Prototyping Program	100.000	46.984	99.107	100.957	-	100.957	102.964	104.961	106.972	109.241	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		
A. Mission Description and Budget Item Justification												
The Rapid Prototyping Program (RPP) develops prototypes to deliver capabilities, reduce risk, and inform requirements. RPP facilitates and accelerates joint, cross-cutting prototyping efforts for the Services and Defense Agencies. This program has the agility to select, fund, and implement projects in the year of execution as new opportunities or threats emerge. Planned funding supports the National Defense Strategy and focus areas that enable USD(R&E) to anticipate and respond to emergent Service and Agency needs and time-sensitive threats. RPP projects fund prototypes addressing specific Service gaps in technology areas including machine learning; advanced autonomous systems; directed energy; electronic warfare; command, control, communications, computers and intelligence, surveillance, and reconnaissance (C4ISR); and, joint lethality.												
B. Accomplishments/Planned Programs (\$ in Millions)									FY 2018	FY 2019	FY 2020	
Title: Multi-Domain Multi-Mission Sensors									12.700	-	-	
Description: This project designed and developed prototype multi-mission intelligence, surveillance, reconnaissance, and tactical sensors through the Air Force multi-domain command and control system (MDC2). The prototype sensors support the DoD's modernization priority of counter-hypersonics. The developed sensors include a low-cost, distributed satellite system consisting of multiple small busses with multi-mode detection capabilities that operate in low Earth orbit. The prototype system leveraged other efforts to develop high speed sensor processing, clutter mitigation algorithms, and low latency sensor-to-shooter correlation processing. FY 2018 funds supported prototype development, testing, integration into MDC2, and operational demonstration. The capability transitioned to the Air Force and Missile Defense Agency.												
Title: Optical Augmentation									9.200	-	-	
Description: This prototyping project rapidly developed a capability that automatically detects the day/night sights used by modern anti-tank guided missiles, enabling the warfighter to detect and engage adversaries from a standoff range with increased lethality. The prototype system consists of current vehicle sensors fused with optical augmentation in near-, short-, medium-, and long-wave infrared bands for increased target discrimination. The prototype detection capability was integrated via rapid technology insertion with the Army's Long Range Advance Scout Surveillance System (LRAS3). The project developed four prototype detection systems for test and validation. The prototypes leveraged partners from the Army Rapid Capabilities Office and the Army Product Manager Ground Soldier Systems. Using FY 2018 funding, the project initiated development, integration, and testing of the system hardware and software. Transition partner funding will support an initial assessment in FY 2020 and a final military utility assessment (MUA) in FY 2021. Following a successful MUA, the systems will be transitioned to the Army LRAS3 program of record, and will inform the Next Generation Combat Vehicle.												

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
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 2018	FY 2019	FY 2020
Title: Seeker Technology for Hypervelocity Projectiles Description: This prototyping project developed innovative seeker technologies suitable for hypervelocity projectiles to enhance combat lethality in complex environments. The prototype is a gun-hardened, low-cost seeker technology that significantly improves accuracy and enables critical multi-mission capability. Multiple seeker technologies for small agile interceptors were integrated and tested using a government developed and built projectiles. The prototype built on work completed in the Office of Naval Research and the Strategic Capabilities Office. FY 2018 funds completed development and testing to support a final flight test with a subsequent transition to a new acquisition program in the Navy.		13.100	-	-
Title: The Perfect Storm Description: This prototyping project supports the command, control, computers, communications intelligence, surveillance, and reconnaissance (C4ISR) key capability area. The Perfect Storm developed an affordable, scalable, forward deployed electronic warfare asset to support missions not currently attainable by other means due to anti-access/area denial and size, weight, and power constraints. The prototype system consists of a multi-kernel, multi-channel application specific integrated circuit, radio frequency transceiver hardware, and software development kit. Prototypes were developed and tested using a small unmanned autonomous system platform. This effort leveraged partners from the U.S. Army Communications-Electronics Research Development and Engineering Center, Intelligence and Information Warfare Directorate. Capabilities transitioned to the U.S. Army and U.S. Navy. Additional details are classified.		10.484	-	-
Title: Mission Rehearsal Trainer (MRT) Description: The previously funded MRT prototyping project developed a distributed learning prototype that trains, prepares, and increases the performance of target intelligence officers thereby creating a more lethal, agile, and resilient force. MRT addressed a lack of on-site training through a scenario driven system that allows the instructor to increase the complexity of a training scenario to improve the intelligence officer's proficiency. MRT partnered with the U.S. Indo-Pacific Command (USINDOPACOM) Joint Intel Operations Center (JIOC) and Massachusetts Institute for Technology Lincoln Laboratory to improve an existing intelligence, surveillance, and reconnaissance training system. During FY 2018, the MRT system was assessed and demonstrated with intel operators and instructors using real world scenarios, while also validating training scenarios specifically desired by the USINDOPACOM JIOC. MRT transitioned to the Defense Intelligence Agency.		1.500	-	-
Title: Machine Learning Technologies Focus Area Description: This focus area leverages joint prototyping capabilities and key machine learning technologies to enable increased situational awareness with data analytics for faster reaction time. Prototype technologies will advance capabilities such as cognitive performance, object discrimination, and interactive task learning. Specific activities include algorithm development, machine learning transfer, and cognitive architecture and modeling. These prototype capabilities will reduce technical and		-	19.000	19.000

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
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 2018	FY 2019	FY 2020
integration risk and provide joint, cross-cutting value to the warfighter. A cross functional team, led by the Office of the Under Secretary of Defense for Research and Engineering (OUSD(R&E)), will review and select prototyping proposals from across the Department of Defense in the year of execution.				
FY 2019 Plans: RPP anticipates supporting one to two machine learning projects in FY 2019. Deliverables will include developmental and fieldable prototypes demonstrated in an operational environment with warfighter participation. The FY 2019 RPP proposal submission cycle started in 1Q FY 2019, and funding awards are planned for 2Q FY 2019.				
FY 2020 Plans: RPP anticipates supporting one to two machine learning projects in FY 2020. Deliverables will include developmental and fieldable prototypes demonstrated in an operational environment with warfighter participation.				
Title: Advanced Autonomous Systems Technologies Focus Area		-	17.000	18.000
Description: This focus area explores advances in autonomy platforms to enable more effective human-machine teaming and collaboration, use of autonomous systems in complex urban environments, and low-cost, scalable autonomous assets to defeat threats. Prototype technologies will advance capabilities such as scalable autonomous behavior, collaborative actions between autonomous systems, human-above-the-loop control, and hardware for next-generation autonomous systems. Specific activities include autonomy algorithm development, modeling and design, and experimentation and evaluation of autonomy platforms. These prototype capabilities will reduce technical and integration risk and provide joint, cross-cutting value to the warfighter. A cross functional team, led by the OUSD(R&E), will review and select prototyping proposals from across the Department of Defense in the year of execution.				
FY 2019 Plans: RPP anticipates supporting one to two autonomy projects in FY 2019. Deliverables will include developmental and fieldable prototypes demonstrated in an operational environment with warfighter participation. The FY 2019 RPP proposal submission cycle started in 1Q FY 2019, and funding awards are planned for 2Q FY 2019.				
FY 2020 Plans: RPP anticipates supporting one to two autonomy projects in FY 2020. Deliverables will include developmental and fieldable prototypes demonstrated in an operational environment with warfighter participation.				
FY 2019 to FY 2020 Increase/Decrease Statement: RPP plans to increase investment in advanced autonomous systems in FY 2020.				
Title: Directed Energy (DE) Technologies Focus Area		-	18.000	18.000

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604331D8Z / <i>Rapid Prototyping Program</i>	Project (Number/Name) 638 / <i>Rapid Prototyping Program</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>Description: This focus area matures key technologies through rapid prototyping to develop DE capabilities while informing concept of operations (CONOPS). DE weapons provide the warfighter with scalable, targeted, and precision engagement while minimizing collateral damage. This focus area will prototype advanced technologies required to enable the broad employment of DE technologies across the joint force. Example technologies include compact, efficient energy generation, energy storage, and thermal management technologies, high efficiency laser diodes, advanced manufacturing and fabrication techniques, and, robust beam control technologies. Specific activities include effects testing to quantify target susceptibility to DE; development, testing, and optimization of DE subsystems; and, integration of weapon prototypes. These prototyping activities will enable faster transition of DE technologies to the warfighter by reducing technical risk, informing joint force CONOPS, and demonstrating new warfighter capabilities enabled by DE. A cross functional team, led by the OUSD(R&E), will review and select prototyping proposals from across the Department of Defense in the year of execution.</p> <p>FY 2019 Plans: RPP anticipates supporting one to two DE projects in FY 2019. Deliverables will include developmental and fieldable prototypes demonstrated in an operational environment with warfighter participation. The FY 2019 RPP proposal submission cycle started in 1Q FY 2019, and funding awards are planned for 2Q FY 2019.</p> <p>FY 2020 Plans: RPP anticipates supporting one to two DE projects in FY 2020. Deliverables will include developmental and fieldable prototypes demonstrated in an operational environment with warfighter participation.</p>			
<p>Title: Electronic Warfare (EW) Technologies Focus Area</p> <p>Description: This focus area develops new concepts and key technologies to improve the ability to detect, locate, and classify electronic threats; deter electronic attacks targeting military operations; defeat electronic attacks using kinetic and non-kinetic methods; and, create electromagnetic interference effects on enemy systems. Prototype technologies will advance capabilities like air and ground electronic support (ES) and electronic attack (EA), tactical EW systems, and EW mission command systems. Specific activities include development and testing of electronic protection systems, distributed and coordinated ES/EA systems, broadband radio frequency components and systems, and EW analysis support systems. These prototype capabilities will reduce technical and integration risk and provide joint, cross-cutting value to the warfighter. A cross functional team, led by the OUSD(R&E), will review and select prototyping proposals from across the Department of Defense in the year of execution.</p> <p>FY 2019 Plans:</p>		-	12.000
			12.000

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604331D8Z / <i>Rapid Prototyping Program</i>	Project (Number/Name) 638 / <i>Rapid Prototyping Program</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
RPP anticipates supporting one to two EW projects in FY 2019. Deliverables will include developmental and fieldable prototypes demonstrated in an operational environment with warfighter participation. The FY 2019 RPP proposal submission cycle started in 1Q FY 2019, and funding awards are planned for 2Q FY 2019.				
FY 2020 Plans: RPP anticipates supporting one to two EW projects in FY 2020. Deliverables will include developmental and fieldable prototypes demonstrated in an operational environment with warfighter participation.				
Title: Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) Description: This focus area explores joint prototypes and concept-of-operations for C4ISR capabilities while deterring the adversary's capabilities. Developed prototypes will improve situational awareness; indications and warnings; threat detection; and, inform tactical and strategic decisions. Counter-C4ISR capabilities will prevent or disrupt the adversary's ability to detect, track, localize, and engage our forces. Specific activities include design and development of interoperable C4ISR system architectures; vulnerability analysis and exploitation; advanced sensors; anti-jam antenna systems; materials with novel electromagnetic properties; on-board processing; fusion of intelligence data; and, platform integration testing. These prototype capabilities will reduce technical and integration risk and provide joint, cross-cutting value to the warfighter. A cross functional team, led by the Office of the Under Secretary of Defense for Research and Engineering, will review and select prototyping proposals from across the Department of Defense in the year of execution. FY 2019 Plans: RPP anticipates supporting one to two C4ISR projects in FY 2019. Deliverables will include developmental and fieldable prototypes demonstrated in an operational environment with warfighter participation. The FY 2019 RPP proposal submission cycle started in 1Q FY 2019, and funding awards are planned for 2Q FY 2019. FY 2020 Plans: RPP anticipates supporting one to two C4ISR projects in FY 2020. Deliverables will include developmental and fieldable prototypes demonstrated in an operational environment with warfighter participation.		-	18.000	18.000
Title: Joint Lethality Focus Area Description: This focus area matures joint prototypes to maintain U.S. dominance in the air, space, and ground domains; rapidly and precisely defeat foreign threats; and, maintain a decisive conventional force. Projects enable the warfighter to identify technical and operational deficiencies; characterize diverse threats in complex environments; explore emerging and novel attack capabilities inside adversaries' defense networks; and, improve warfighter readiness. Prototype technologies will advance and evaluate capabilities in long range weapons; kinetic and non-kinetic precision weapons; novel delivery systems and weapon effects; and, countermeasure mitigation. These prototype capabilities will reduce technical and integration risk; and, provide joint,		-	15.107	15.957

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604331D8Z / <i>Rapid Prototyping Program</i>	Project (Number/Name) 638 / <i>Rapid Prototyping Program</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
cross-cutting value to the warfighter. A cross functional team, led by the OUDS(R&E), will review and select prototyping proposals from across the Department of Defense in the year of execution.			
FY 2019 Plans: RPP anticipates supporting one to two joint lethality projects in FY 2019. Deliverables will include developmental and fieldable prototypes demonstrated in an operational environment with warfighter participation. The FY 2019 RPP proposal submission cycle started in 1Q FY 2019, and funding awards are planned for 2Q FY 2019.			
FY 2020 Plans: RPP anticipates supporting one to two joint lethality projects in FY 2020. Deliverables will include developmental and fieldable prototypes demonstrated in an operational environment with warfighter participation.			
FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 and FY 2020 are funded for a similar level of effort in this focus area. Minor changes are due to small internal baseline adjustments.			
Accomplishments/Planned Programs Subtotals		46.984	99.107
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.			
E. Performance Metrics A new start program in FY 2017, RPP successfully completed its first two prototyping projects in FY 2018 and transitioned both with an overall transition rate of 100 percent. The FY 2018 remaining projects are on track toward completion and transition. All RPP projects are monitored for schedule deviation, transition outcome, and deliverables such as hardware, software, and other components.			

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense												Date: February 2019			
Appropriation/Budget Activity 0400 / 4						R-1 Program Element (Number/Name) PE 0604331D8Z / <i>Rapid Prototyping Program</i>						Project (Number/Name) 638 / <i>Rapid Prototyping Program</i>			
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Hypersonic Tracking with Multi-Mission Sensors	MIPR	Secretary of the Air Force Financial Management (SAF/FM) : Washington D.C.	-	12.700	Jul 2018	-		-		-		-	Continuing	Continuing	-
Optical Augmentation	MIPR	U.S. Army Night Vision and Electronic Sensors Directorate : Fort Belvoir, VA	-	2.608	Aug 2018	-		-		-		-	Continuing	Continuing	-
Optical Augmentation	MIPR	U.S. Army Night Vision and Electronic Sensors : Fort Belvoir, VA	-	6.592	Sep 2018	-		-		-		-	Continuing	Continuing	-
Seeker Technology for Hypervelocity Projectiles	MIPR	U.S. Army Armament Research, Development and Engineering Center : Picatinny Arsenal, NJ (5 MIPRs)	-	5.626	Jul 2018	-		-		-		-	Continuing	Continuing	-
Seeker Technology for Hypervelocity Projectiles	MIPR	U.S. Naval Sea Systems Command : Washington Navy Yard, D.C.	-	0.500	Sep 2018	-		-		-		-	Continuing	Continuing	-
Seeker Technology for Hypervelocity Projectiles	IA	U.S. Department of Energy National Nuclear Security Administration : Albuquerque, NM	-	0.817	Nov 2018	-		-		-		-	Continuing	Continuing	-
Seeker Technology for Hypervelocity Projectiles	MIPR	U.S. Naval Air Warfare Center Weapons Division : China Lake, CA	-	0.577	Aug 2018	-		-		-		-	Continuing	Continuing	-
Seeker Technology for Hypervelocity Projectiles	MIPR	MULTI : MULTI	-	5.580	Nov 2018	-		-		-		-	Continuing	Continuing	-

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense												Date: February 2019			
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)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
The Perfect Storm	MIPR	U.S. Army Communications-Electronics Command (6 MIPRs) : Aberdeen Proving Ground, MD	-	4.713	Nov 2018	-		-		-		-	Continuing	Continuing	-
The Perfect Storm	MIPR	U.S. Defense MicroElectronics Activity : McClellan, CA	-	1.252	Aug 2018	-		-		-		-	Continuing	Continuing	-
The Perfect Storm	MIPR	U.S. Army Armament Research, Development and Engineering Center : Picatinny Arsenal, NJ	-	1.248	Aug 2018	-		-		-		-	Continuing	Continuing	-
The Perfect Storm	MIPR	MULTI : MULTI	-	3.271	Dec 2018	-		-		-		-	Continuing	Continuing	-
Mission Rehearsal Training (MRT)	MIPR	U.S. Defense Intelligence Agency : Washington, D.C.	-	1.500	Sep 2018	-		-		-		-	Continuing	Continuing	-
VARIOUS	MIPR	MULTI : MULTI	100.000	-		99.107		100.957		-		100.957	Continuing	Continuing	-
Subtotal			100.000	46.984		99.107		100.957		-		100.957	Continuing	Continuing	N/A
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			100.000	46.984		99.107		100.957		-		100.957	Continuing	Continuing	N/A
Remarks															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense			Date: February 2019
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604331D8Z / <i>Rapid Prototyping Program</i>	Project (Number/Name) 638 / <i>Rapid Prototyping Program</i>	

	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
<i>Hypersonic Tracking with Multi-Mission Sensors</i>																												
Contract Award/Project Kickoff																												
Prototype Design Development, Integration (Additional details are classified)																												
Prototype Field Demonstration																												
<i>Optical Augmentation</i>																												
Contract Award/Project Kickoff																												
Prototype Design, Build (Sensor and other detection systems)																												
Prototype Test, Delivery																												
<i>Seeker Technology for Hypervelocity Projectiles</i>																												
Contract Award/Project Kickoff																												
Prototype Seeker Design, Development, Integration																												
Prototype Field Demonstration																												
<i>The Perfect Storm</i>																												
Contract Award/Project Kickoff																												
Prototype Design Development, Integration (Sensors, Receivers, Hardware/Software)																												
Prototype Field Demonstration																												
<i>Mission Rehearsal Training (MRT)</i>																												
Contract Award/Project Kickoff																												
Prototype Design Development, Integration (Hardware/Software)																												

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604331D8Z / <i>Rapid Prototyping Program</i>	Project (Number/Name) 638 / <i>Rapid Prototyping Program</i>
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	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Prototype Field Demonstration																												
Prototype Proposal Selection																												
Proposal Submissions - December 3, 2019																												
Proposal Evaluations - December 4 - January 10, 2019																												
Proposal Selections - January 24, 2019																												
Project Start - January 31, 2019																												
Prototype Project Development																												
System Development, Integration, Testing - February 2019 - March 2020																												
Prototype Project Field Test																												
Prototype Demonstration - April 2020 - September 2020																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Office of the Secretary Of Defense

Date: February 2019

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

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>Hypersonic Tracking with Multi-Mission Sensors</i>				
Contract Award/Project Kickoff	4	2018	4	2018
Prototype Design Development, Integration (Additional details are classified)	4	2018	3	2019
Prototype Field Demonstration	4	2019	4	2019
<i>Optical Augmentation</i>				
Contract Award/Project Kickoff	4	2018	4	2018
Prototype Design, Build (Sensor and other detection systems)	4	2018	3	2019
Prototype Test, Delivery	4	2019	4	2019
<i>Seeker Technology for Hypervelocity Projectiles</i>				
Contract Award/Project Kickoff	4	2018	4	2018
Prototype Seeker Design, Development, Integration	4	2018	3	2019
Prototype Field Demonstration	4	2019	4	2019
<i>The Perfect Storm</i>				
Contract Award/Project Kickoff	4	2018	4	2018
Prototype Design Development, Integration (Sensors, Receivers, Hardware/Software)	4	2018	3	2019
Prototype Field Demonstration	4	2019	4	2019
<i>Mission Rehearsal Training (MRT)</i>				
Contract Award/Project Kickoff	4	2018	4	2018
Prototype Design Development, Integration (Hardware/Software)	4	2018	2	2019
Prototype Field Demonstration	3	2019	3	2019
<i>Prototype Proposal Selection</i>				
Proposal Submissions - December 3, 2019	1	2019	1	2019

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Office of the Secretary Of Defense			Date: February 2019		
Appropriation/Budget Activity 0400 / 4		R-1 Program Element (Number/Name) PE 0604331D8Z / Rapid Prototyping Program		Project (Number/Name) 638 / Rapid Prototyping Program	
		Start		End	
Events by Sub Project		Quarter	Year	Quarter	Year
Proposal Evaluations - December 4 - January 10, 2019		1	2019	2	2019
Proposal Selections - January 24, 2019		2	2019	2	2019
Project Start - January 31, 2019		2	2019	2	2019
Prototype Project Development					
System Development, Integration, Testing - February 2019 - March 2020		2	2019	2	2020
Prototype Project Field Test					
Prototype Demonstration - April 2020 - September 2020		3	2020	4	2020

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

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 0604341D8Z I DIU Prototyping							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	0.000	0.000	92.000	0.000	92.000	13.378	12.930	12.489	12.784	Continuing	Continuing
843: DIU Prototyping	-	0.000	0.000	17.000	0.000	17.000	13.378	12.930	12.489	12.784	Continuing	Continuing
844: National Security Innovation Capital	-	0.000	0.000	75.000	0.000	75.000	0.000	0.000	0.000	0.000	Continuing	Continuing

Note

This is a new Program Element and new projects for DIU Prototyping and the National Security Innovation Capital (NSIC) programs.

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

A. Mission Description and Budget Item Justification

DIU mission is to accelerate innovation in the commercially-focused technology sector to the warfighter. The 2018 National Defense Strategy asserts that we have returned to an era of inter-state strategic competition with Russia and China, heightening the sense of urgency with which the nation, and Department of Defense (DoD) in particular, must reform our acquisition policies and approach to sustaining military-technical superiority. Adversaries are challenging the U.S. across several dimensions. Most importantly, adversaries are at par or ahead of the U.S. in critical technology areas. Consistent with the FY 2020 Office of Management and Budget (OMB)/Office of Science and Technology Policy (OSTP) research and development budget priorities, this new era of competition requires technological superiority to ensure ability to project power, maintain international norms and rule of law, and to serve as a credible deterrence. Notably, the critical technologies that forge military-technical superiority are increasingly dual-use and rapidly developed by the commercial sector.

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

The DIU Prototyping program will find and provide access to technology companies on behalf of DoD organizations. Additionally, DIU will execute projects to leverage commercial sector technology analogous to military application thereby increasing dual-use technology agility for the DoD. DIU Prototyping funds will facilitate the award of projects that can augment commercial technologies, existing government-owned capabilities or concepts for defense application. The National Security Innovation Capital (NSIC) will fund the commercialization and scaling dual-use, hardware-based technologies that are critical to the military. These technology areas are currently

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0604341D8Z I <i>DIU Prototyping</i>
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severely under-served by the private U.S. venture capital industry and often funded by strategic and persistent capital from China. In FY 2020, NSIC plans to attract private capital to leverage investments in about 8-12 selected projects that include batteries, drones, and quantum sensors.

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	0.000	0.000	0.000	0.000	0.000
Current President's Budget	0.000	0.000	92.000	0.000	92.000
Total Adjustments	0.000	0.000	92.000	0.000	92.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• FY 2020 Transfer from DIU O&M	-	-	17.000	-	17.000
• FY 2020 DIU Increase for NSIC	-	-	75.000	-	75.000

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

Project: 843: *DIU Prototyping*

Congressional Add: *N/A*

Congressional Add Subtotals for Project: 843

Project: 844: *National Security Innovation Capital*

Congressional Add: *N/A*

Congressional Add Subtotals for Project: 844

Congressional Add Totals for all Projects

FY 2018	FY 2019
0.000	0.000
0.000	0.000
0.000	0.000
0.000	0.000
0.000	0.000

Change Summary Explanation

This is a new Program Element with two new Project Codes for DIU Prototyping/Project 843, \$17.000 million, and National Security Innovation Capital (NSIC)/Project 844, \$75.000 million programs. For Project 843, FY 2020 \$17.000 million was transferred from WHS O&M 0901583D8W to RDT&E, DW PE 0604341D8Z/843 DIU Prototyping. Project 844 NSIC is a new program add. The overall increase of \$92.000 million will fund prototype projects to leverage commercial sector technology analogous to military application thereby increasing dual-use technology agility for the DoD. The DIU Prototyping and NSIC focus

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I</i> BA 4: <i>Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0604341D8Z <i>I DIU Prototyping</i>	
<p>areas are complementary and we envision that this integration will not only save funds in the future, but more importantly, grow the National Security Innovation Base (NSIB) by attracting new NSIB suppliers and improve the adoption of commercial technologies for the warfighter.</p>		

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
843: DIU Prototyping	-	0.000	0.000	17.000	0.000	17.000	13.378	12.930	12.489	12.784	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This is a new program element and new project, P843, for DIU Prototyping.

A. Mission Description and Budget Item Justification

DIUx mission is to accelerate innovation in the commercially-focused technology sector to the warfighter. Initially, DIUx was managed by the Under Secretary of Defense Acquisition, Technology and Logistics (OUSD(AT&L)) when it was established in July 2015. In May 2016, DIUx was placed under the control of the Secretary of Defense and administratively managed by WHS. In July 2018, DIUx was realigned from WHS to the OUSD(R&E). In August 2018, DIUx was re-designated the Defense Innovation Unit (DIU) to signify a permanence of the program. Effective FY 2020, DIU funding will transfer from WHS to OSD consistent with the functional realignment to OUSD(R&E).

The 2018 National Defense Strategy asserts that we have returned to an era of inter-state strategic competition with Russia and China, heightening the sense of urgency with which the nation, and DoD in particular, must reform our acquisition policies and approach to sustaining military-technical superiority. Adversaries are challenging the U.S. across several dimensions. Most importantly, adversaries are at par or ahead of the U.S. in critical technology areas. Consistent with the FY 2020 OMB/OSTP research and development budget priorities, this new era of competition requires technological superiority to ensure ability to project power, maintain international norms and rule of law, and to serve as a credible deterrence. Notably, the critical technologies that forge military-technical superiority are increasingly dual-use and rapidly developed by the commercial sector.

The DIU Prototyping program will find and provide access to technology companies on behalf of DoD organizations. Additionally, DIU will execute projects to leverage commercial sector technology analogous to military application thereby increasing dual-use technology agility for the DoD. In FY 2020, DIU Prototyping funds will facilitate the award of projects that can augment commercial technologies, existing government-owned capabilities or concepts for defense application.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Defense Innovation Unit (DIU) Prototyping	0.000	0.000	17.000	0.000	17.000
Description: In FY 2020, DIU will execute projects to leverage commercial sector technology analogous to military application thereby increasing dual-use technology agility for the DoD. DIU Prototyping funds will facilitate the award of projects that can augment commercial technologies, existing government-owned capabilities or concepts for defense application.					
FY 2019 Plans:					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense				Date: February 2019		
Appropriation/Budget Activity 0400 / 4		R-1 Program Element (Number/Name) PE 0604341D8Z / DIU Prototyping		Project (Number/Name) 843 / DIU Prototyping		
B. Accomplishments/Planned Programs (\$ in Millions)						
		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
N/A						
FY 2020 Base Plans: In FY 2020, DIU Prototyping funds will facilitate follow-on prototype contract awards of projects that can augment commercial technologies, existing government-owned capabilities or concepts for defense application.						
FY 2020 OCO Plans: N/A						
FY 2019 to FY 2020 Increase/Decrease Statement: The FY 2020 increase of \$17.000 million will fund the commercialization and scaling dual-use, hardware-based technologies that are critical to the military.						
Accomplishments/Planned Programs Subtotals		0.000	0.000	17.000	0.000	17.000
		FY 2018	FY 2019			
Congressional Add: N/A FY 2018 Accomplishments: N/A FY 2019 Plans: N/A		0.000	0.000			
Congressional Adds Subtotals		0.000	0.000			
C. Other Program Funding Summary (\$ in Millions)						
N/A						
Remarks						
For Project 843, FY 2020 \$17.000 million was transferred from WHS O&M 0901583D8W to RDT&E, DW PE 0604341D8Z/843 DIU Prototyping.						
D. Acquisition Strategy						
N/A						
E. Performance Metrics						
1. Speed - average days to award a prototype project at the close of a solicitation compared to the traditional acquisition system. 2. Cost Savings - estimated amount saved as a result of DIU-driven solutions. 3. Scale - measures the success of transitioning successful projects or methodologies, and increasing the number / diversity of partnerships within the National Security Innovation Base.						

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604341D8Z / <i>DIU Prototyping</i>	Project (Number/Name) 843 / <i>DIU Prototyping</i>
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Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
DIU Prototyping	MIPR	Various : Various	-	-		-		17.000	Jan 2020	-		17.000	Continuing	Continuing	-
Subtotal			-	-		-		17.000		-		17.000	Continuing	Continuing	N/A
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			-	-		0.000		17.000		-		17.000	Continuing	Continuing	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense										Date: February 2019			
Appropriation/Budget Activity					R-1 Program Element (Number/Name)					Project (Number/Name)			
0400 / 4					PE 0604341D8Z / DIU Prototyping					843 / DIU Prototyping			

	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
DIU Prototyping																												
DIU Prototyping																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604341D8Z / <i>DIU Prototyping</i>	Project (Number/Name) 843 / <i>DIU Prototyping</i>
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Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>DIU Prototyping</i>				
DIU Prototyping	2	2020	3	2021

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 4					R-1 Program Element (Number/Name) PE 0604341D8Z / <i>DIU Prototyping</i>				Project (Number/Name) 844 / <i>National Security Innovation Capital</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
844: <i>National Security Innovation Capital</i>	-	0.000	0.000	75.000	0.000	75.000	0.000	0.000	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This is a new program element and new project 844 for the National Security Innovation Capital (NSIC).

A. Mission Description and Budget Item Justification

DIUx mission is to accelerate innovation in the commercially-focused technology sector to the warfighter. Initially, DIUx was managed by the Under Secretary of Defense Acquisition, Technology and Logistics (OUSD(AT&L)) when it was established in July 2015. In May 2016, DIUx was placed under the control of the Secretary of Defense and administratively managed by WHS. In July 2018, DIUx was realigned from WHS to the OUSD(R&E). In August 2018, DIUx was re-designated the Defense Innovation Unit (DIU) to signify a permanence of the program. Effective FY 2020, DIU funding will transfer from WHS to OSD consistent with the functional realignment to OUSD(R&E).

The 2018 National Defense Strategy asserts that we have returned to an era of inter-state strategic competition with Russia and China, heightening the sense of urgency with which the nation, and DoD in particular, must reform our acquisition policies and approach to sustaining military-technical superiority. Adversaries are challenging the U.S. across several dimensions. Most importantly, adversaries are at par or ahead of the U.S. in critical technology areas. Consistent with the FY 2020 OMB/OSTP research and development budget priorities, this new era of competition requires technological superiority to ensure ability to project power, maintain international norms and rule of law, and to serve as a credible deterrence. Notably, the critical technologies that forge military-technical superiority are increasingly dual-use and rapidly developed by the commercial sector.

The National Security Innovation Capital (NSIC) will fund 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.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: National Security Innovation Capital (NSIC)	0.000	0.000	75.000	0.000	75.000
Description: The National Security Innovation Capital (NSIC) will fund the commercialization and scaling dual-use, hardware-based technologies that are critical to the military. These technology areas are currently severely underserved by the private U.S. venture capital industry and often funded by strategic and persistent capital from China. NSIC will attract private capital to leverage DoD investments in select priority projects that include batteries, drones, and quantum sensors.					
FY 2019 Plans:					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense				Date: February 2019		
Appropriation/Budget Activity 0400 / 4		R-1 Program Element (Number/Name) PE 0604341D8Z / <i>DIU Prototyping</i>		Project (Number/Name) 844 / <i>National Security Innovation Capital</i>		
B. Accomplishments/Planned Programs (\$ in Millions)						
		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
N/A						
FY 2020 Base Plans: In FY 2020, NSIC plans to attract private capital to leverage investments in about 8-12 selected projects that include batteries, drones, and quantum sensors.						
FY 2020 OCO Plans: N/A						
FY 2019 to FY 2020 Increase/Decrease Statement: The FY 2020 increase of \$75.000 million will fund the commercialization and scaling dual-use, hardware-based technologies that are critical to the military.						
Accomplishments/Planned Programs Subtotals		0.000	0.000	75.000	0.000	75.000
		FY 2018	FY 2019			
Congressional Add: N/A FY 2018 Accomplishments: N/A FY 2019 Plans: N/A		0.000	0.000			
Congressional Adds Subtotals		0.000	0.000			
C. Other Program Funding Summary (\$ in Millions)						
N/A						
Remarks						
This is a new project, 844 for NSIC \$75.000 million.						
D. Acquisition Strategy						
N/A						
E. Performance Metrics						
1. Percent of NSIC-funded companies that secure a DoD contract in 3, 5, 7 years. 2. Increasing the number / diversity of partnerships within the National Security Innovation Base. 3. Stimulating private venture capitalists to invest in dual-use hardware based technologies that service military needs.						

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense												Date: February 2019			
Appropriation/Budget Activity 0400 / 4						R-1 Program Element (Number/Name) PE 0604341D8Z I DIU Prototyping				Project (Number/Name) 844 I National Security Innovation Capital					
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
NSIC	C/TBD	Various : Various	0.000	0.000		0.000		75.000		0.000		75.000	Continuing	Continuing	-
Subtotal			0.000	0.000		0.000		75.000		0.000		75.000	Continuing	Continuing	N/A
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			0.000	0.000		0.000		75.000		0.000		75.000	Continuing	Continuing	N/A
Remarks															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense

Date: February 2019

Appropriation/Budget Activity	R-1 Program Element (Number/Name)	Project (Number/Name)
0400 / 4	PE 0604341D8Z / DIU Prototyping	844 / National Security Innovation Capital

	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
National Security Innovation Capital (NSIC)																												
NSIC																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604341D8Z / <i>DIU Prototyping</i>	Project (Number/Name) 844 / <i>National Security Innovation Capital</i>
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Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>National Security Innovation Capital (NSIC)</i>				
NSIC	2	2020	3	2021

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

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 0604400D8Z / Department of Defense (DoD) Unmanned Systems Common Development
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	65.930	7.839	7.763	3.021	0.000	3.021	3.074	3.114	3.170	3.225	Continuing	Continuing
440: UAS Airspace Integration	37.620	4.662	4.980	0.984	0.000	0.984	1.076	1.117	1.163	1.187	Continuing	Continuing
442: Interoperability	26.665	3.007	2.453	1.788	0.000	1.788	1.649	1.748	1.658	1.682	Continuing	Continuing
443: Unmanned Systems Roadmap	1.645	0.170	0.330	0.249	0.000	0.249	0.349	0.249	0.349	0.356	Continuing	Continuing

A. Mission Description and Budget Item Justification

The Department of Defense (DoD) Unmanned Systems (UxS) Common Development program is a joint effort to develop and demonstrate common standards, architectures, and technologies that address unmanned systems' issues across all domains and all Military Services. The intent is to increase interoperability and effectiveness by promoting cooperative development of solutions that are applicable across all unmanned systems. This effort initially focused on addressing DoD unmanned aircraft systems (UAS), to include integration into the National Airspace System (NAS) and a common, interoperable ground station architecture and associated interface standards. While UAS initially were the primary focus, interoperability among all unmanned and manned systems is the long-term goal.

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	3.967	3.781	3.134	0.000	3.134
Current President's Budget	7.839	7.763	3.021	-	3.021
Total Adjustments	3.872	3.982	-0.113	0.000	-0.113
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	4.000	4.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.120	-			
• FFRDC	-0.008	-0.018	-	-	-
• INV-D-032 CDBP - Biological and Chemical Threats Preparedness	-	-	-0.113	0.000	-0.113

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

Project: 440: UAS Airspace Integration

Congressional Add: Airspace Integration

FY 2018	FY 2019
4.000	4.000

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>		R-1 Program Element (Number/Name) PE 0604400D8Z <i>I Department of Defense (DoD) Unmanned Systems Common Development</i>	
<u>Congressional Add Details (\$ in Millions, and Includes General Reductions)</u>			
		FY 2018	FY 2019
Congressional Add Subtotals for Project: 440		4.000	4.000
Congressional Add Totals for all Projects		4.000	4.000
<u>Change Summary Explanation</u> A \$4.0M FY2019 Congressional Add was provided on October 2018.			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
440: UAS Airspace Integration	37.620	4.662	4.980	0.984	0.000	0.984	1.076	1.117	1.163	1.187	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Airborne Sense-and-Avoid (ABSAA) and Ground Based Sense-and-Avoid (GBSAA) technology development transitioned to UAS programs of record during FY2013. Focus 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 US and foreign national 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, Shadow operations at Cherry Point). This system will provide a near-term solution and is an integral part of the long-term permanent solution. Long term GBSAA systems and Unmanned Traffic Management (UTM) architectures, operating concepts, standards and technology are being developed to allow DoD, commercial and private manned and Group 1-5 Unmanned Aircraft to operate safely and effectively in the national Airspace. The change in airspace procedures, Airspace de-confliction and Traffic Management requires new processes and procedures for safe and secure national airspace access.

This joint funding also supports development of common operating concepts, policy, standards, modeling and simulation, and technology to enable DoD UAS to routinely access the national and international airspace systems.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Unmanned Aircraft System Airspace Integration Initiatives	0.662	0.980	0.984	0.000	0.984
Description: Starting in FY 2010 the Department's sense-and-avoid (SAA) developmental efforts are enhanced by this defense-wide program element. This program has provided joint funding to accelerate the development of SAA technology and standards to enable UAS to routinely access the national and international airspace systems. This program also supports development of UAS airspace integration policy and standards, as well as the modeling, simulation, and operational analysis needed to validate the standards. In FY 2013 ABSAA and GBSAA efforts transitioned to the Services.					
FY 2019 Plans:					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense			Date: February 2019			
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Develop future Policy and architectures that support the operation of DoD, Commercial, and Private Group 1-5 UAS systems in the national Airspace safely by developing an Unmanned Traffic Management (UTM) system. Investigate and draft Cyber security concept of operations for Manned and Unmanned Aircraft Systems operating in the National Airspace with a focus on Groups 1-2 UAS. Evaluate and validate identified best-candidate solutions for low size, weight, power and cost technology supporting military sUAS operations in national, international and foreign national airspace. Develop quantitative safety assessment approaches that support unique UAS operations to support emerging DoD needs and inform future rulemaking. Make formal recommendations for separation minima that enable low-altitude military UAS to remain well clear of other aircraft. Continue to engage the FAA to advance DoD UAS airspace integration. Investigate and draft Cyber security concept of operations for Manned and Unmanned Aircraft Systems operating in the National Airspace.						
FY 2020 Base Plans: Develop future Policy and architectures that support the operation of DoD, Commercial, and Private Group 1-5 UAS systems in the national Airspace safely by developing an Unmanned Traffic Management (UTM) system. Investigate and draft Cyber security concept of operations for Manned and Unmanned Aircraft Systems operating in the National Airspace with a focus on Groups 1-2 UAS. Evaluate and validate identified best-candidate solutions for low size, weight, power and cost technology supporting military sUAS operations in national, international and foreign national airspace. Develop quantitative safety assessment approaches that support unique UAS operations to support emerging DoD needs and inform future rulemaking. Make formal recommendations for separation minima that enable low-altitude military UAS to remain well clear of other aircraft. Continue to engage the FAA to advance DoD UAS airspace integration. Investigate and draft Cyber security concept of operations for Manned and Unmanned Aircraft Systems operating in the National Airspace.						
FY 2020 OCO Plans: N/A						
FY 2019 to FY 2020 Increase/Decrease Statement: FY20 nominal increase due to increasing contract costs. FY19 budget increase due to FY19 Congressional Add of mandatory increase in mission costs.						
Accomplishments/Planned Programs Subtotals		0.662	0.980	0.984	0.000	0.984
		FY 2018	FY 2019			
Congressional Add: Airspace Integration		4.000	4.000			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019												
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604400D8Z / <i>Department of Defense (DoD) Unmanned Systems Common Development</i>	Project (Number/Name) 440 / <i>UAS Airspace Integration</i>												
<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width:70%;"></th> <th style="width:15%; text-align: center;">FY 2018</th> <th style="width:15%; text-align: center;">FY 2019</th> </tr> </thead> <tbody> <tr> <td> FY 2018 Accomplishments: Completed Initial Operational Capabilities for Ground Based Sense- and-Avoid (GBSAA) Capabilities at Grand Fork AFB in North Dakota and Beale AFB in California. Kicked off integration of GBSAA at March AFB in Fargo North Dakota and Air National Guard (ANG) AFB in Syracuse New York . Completed IOC and Training requirements for GBSAA at ANG AFB in Syracuse New York. Completed a CONOPS for DoD utilization of the Draft UTM Architecture. Completed UTM Modeling and Simulation of DoD operations using the UTM Architecture with DoD modifications. </td> <td></td> <td></td> </tr> <tr> <td> FY 2019 Plans: Complete Final Operational Capability at Grand Forks and Beale AFB. Integrate GBSAA at Fargo and March AFB. Complete full testing of UTM Architecture and DoD unmanned Service Supplier System interfaces in coordination with the Department of Homeland Security. Conduct Integration of UTM into DoD Counter UAS Systems. </td> <td></td> <td></td> </tr> <tr> <td align="right">Congressional Adds Subtotals</td> <td align="center">4.000</td> <td align="center">4.000</td> </tr> </tbody> </table>				FY 2018	FY 2019	FY 2018 Accomplishments: Completed Initial Operational Capabilities for Ground Based Sense- and-Avoid (GBSAA) Capabilities at Grand Fork AFB in North Dakota and Beale AFB in California. Kicked off integration of GBSAA at March AFB in Fargo North Dakota and Air National Guard (ANG) AFB in Syracuse New York . Completed IOC and Training requirements for GBSAA at ANG AFB in Syracuse New York. Completed a CONOPS for DoD utilization of the Draft UTM Architecture. Completed UTM Modeling and Simulation of DoD operations using the UTM Architecture with DoD modifications.			FY 2019 Plans: Complete Final Operational Capability at Grand Forks and Beale AFB. Integrate GBSAA at Fargo and March AFB. Complete full testing of UTM Architecture and DoD unmanned Service Supplier System interfaces in coordination with the Department of Homeland Security. Conduct Integration of UTM into DoD Counter UAS Systems.			Congressional Adds Subtotals	4.000	4.000
	FY 2018	FY 2019												
FY 2018 Accomplishments: Completed Initial Operational Capabilities for Ground Based Sense- and-Avoid (GBSAA) Capabilities at Grand Fork AFB in North Dakota and Beale AFB in California. Kicked off integration of GBSAA at March AFB in Fargo North Dakota and Air National Guard (ANG) AFB in Syracuse New York . Completed IOC and Training requirements for GBSAA at ANG AFB in Syracuse New York. Completed a CONOPS for DoD utilization of the Draft UTM Architecture. Completed UTM Modeling and Simulation of DoD operations using the UTM Architecture with DoD modifications.														
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Congressional Adds Subtotals	4.000	4.000												
C. Other Program Funding Summary (\$ in Millions) N/A														
Remarks														
D. Acquisition Strategy N/A														
E. Performance Metrics N/A														

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

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
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Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
GBSAA	MIPR	USAF A3 AFLCMC/ HBAG (VOLPE/ MITRE) : AFLCMC/ HBAG	33.672	0.340	Jul 2018	0.480	Jul 2019	0.160		0.000		0.160	Continuing	Continuing	-
DoD UTM	MIPR	NASA : Ames Research California	0.985	0.150	Oct 2018	3.000	Feb 2019	0.387		0.000		0.387	Continuing	Continuing	-
National Guard GBSAA	MIPR	Army PM UAS : Army Redstone, Alabama	1.643	3.200		1.020	Apr 2019	0.000		0.000		0.000	Continuing	Continuing	-
Subtotal			36.300	3.690		4.500		0.547		0.000		0.547	Continuing	Continuing	N/A

Remarks

NA

Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
USAF - A3 PBFA Support	Option/ LH	USAF A3 AFLCMC/ HBAG : AFLCMC/ HBAG	1.320	0.972	Mar 2018	0.480	Mar 2019	0.437		0.000		0.437	Continuing	Continuing	-
Subtotal			1.320	0.972		0.480		0.437		0.000		0.437	Continuing	Continuing	N/A

Remarks

NA

			Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			37.620	4.662	4.980	0.984	0.000	0.984	Continuing	Continuing	N/A

Remarks

NA

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense			Date: February 2019
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	

	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
UAS Airspace Integration																												
GBSAA Development and Integration																												
Unmanned Traffic Management																												
UAS Integration NAS support																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Office of the Secretary Of Defense			Date: February 2019
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

Events by Sub Project	Start		End	
	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

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
442: Interoperability	26.665	3.007	2.453	1.788	0.000	1.788	1.649	1.748	1.658	1.682	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		
A. Mission Description and Budget Item Justification												
The Interoperability project will develop and demonstrate an interoperable, standards-based, open architecture solution for cross-domain (air, ground, maritime) unmanned systems. The intent is to improve joint and coalition interoperability and to promote competition through the implementation of open standards and open architectures.												
B. Accomplishments/Planned Programs (\$ in Millions)								FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Interoperability								3.007	2.453	1.788	0.000	1.788
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 2019 Plans: Support the continued development and implementation of the SAE working group for UAS Control Segment Architecture (UCS) interfaces and Joint Architecture Unmanned System (JAUS). 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 Artificial Intelligence (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 Continue support to DoD Interoperability IPT. Develop a UAS Architecture for Small Unmanned Systems Validate Autonomous Safety Precepts for Unmanned Systems Improve cybersecurity and communication links of UxS												
FY 2020 Base Plans:												

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense				Date: February 2019	
Appropriation/Budget Activity 0400 / 4		R-1 Program Element (Number/Name) PE 0604400D8Z / <i>Department of Defense (DoD) Unmanned Systems Common Development</i>		Project (Number/Name) 442 / <i>Interoperability</i>	

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
<p>Support the continued development and implementation of the SAE working group for UAS Control Segment Architecture (UCS) interfaces and Joint Architecture Unmanned System (JAUS).</p> <p>Develop a Joint Communications Architecture for Unmanned systems (JCAUS) and demonstrate a JCAUS compliant prototypes to validate and further mature the architecture.</p> <p>Develop Safety standards and policy for Unmanned and Autonomous systems that will allow for the incorporation of Artificial Intelligence (AI).</p> <p>Continue support for Unmanned Systems Interoperability and Integration workshop/technical exchange meeting.</p> <p>Develop and Unmanned system autonomous test and Evaluation standards and architectures using modeling and simulation.</p> <p>Investigate a Cyber secure solution for integrating Artificial Intelligent systems into Unmanned Systems</p> <p>Continue support to DoD Interoperability IPT.</p> <p>Develop a UAS Architecture for Small Unmanned Systems</p> <p>Validate Autonomous Safety Precepts for Unmanned Systems</p> <p>Improve cybersecurity and communication links of UxS</p> <p><i>FY 2020 OCO Plans:</i> N/A</p> <p><i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> The development of a Joint Communications Architecture for Unmanned Systems to support bandwidth requirements for multiple program of records based on the DoD's reduction of Spectrum allocation. Require Blue UAS architecture to support Services and reduce Cyber Security concerns</p>					
Accomplishments/Planned Programs Subtotals	3.007	2.453	1.788	0.000	1.788

C. Other Program Funding Summary (\$ in Millions) N/A	
Remarks	
D. Acquisition Strategy n/a	
E. Performance Metrics n/a	

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

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
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Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
UxS Interoperability and Architecture Development	MIPR	Labs, Warfare Centers, and DoD components and support : DoD Labs, Warefare Center, DoD and support service	26.665	3.007	Sep 2018	2.453	Sep 2019	1.788	Apr 2020	0.000		1.788	Continuing	Continuing	-
Subtotal			26.665	3.007		2.453		1.788		0.000		1.788	Continuing	Continuing	N/A

Remarks

NA

	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	26.665	3.007	2.453	1.788	0.000	1.788	Continuing	Continuing	N/A

Remarks

NA

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense										Date: February 2019									
Appropriation/Budget Activity					R-1 Program Element (Number/Name)					Project (Number/Name)									
0400 / 4					PE 0604400D8Z / Department of Defense (DoD) Unmanned Systems Common Development					442 / Interoperability									

	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
UxS Interoperability and Architecture Development																												
Interoperability and Open Architecture																												
UxS Safety																												
UxS Development																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Office of the Secretary Of Defense			Date: February 2019
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

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>UxS Interoperability and Architecture Development</i>				
Interoperability and Open Architecture	1	2018	4	2024
UxS Safety	2	2018	4	2024
UxS Development	1	2018	4	2024

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
443: Unmanned Systems Roadmap	1.645	0.170	0.330	0.249	0.000	0.249	0.349	0.249	0.349	0.356	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This effort supports the Department's Unmanned Systems Integrated Roadmap and updates. The roadmap provides a DoD vision for the continuing development, fielding and employment of unmanned systems technologies; establishes the current state of unmanned systems in today's force; and outlines a strategy to address common challenges to achieve the shared vision across all unmanned domains (air, ground, and maritime).

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Unmanned Systems Roadmap	0.170	0.330	0.249	0.000	0.249
Description: Develops, Drafts, and Produces the Department's Unmanned Systems Integrated Roadmap.					
FY 2019 Plans:					
FY18 Accomplishment					
2017 Unmanned System Roadmap completed/published					
FY19 Plans					
Release the FY19 Unmanned Systems Integrated Roadmap					
Update the Department's Unmanned Systems Integrated Roadmap and perform related studies supporting the Department's vision for unmanned systems.					
Integrate feedback, responses and new technology into the FY19 Roadmap.					
Investigate changes to concept of operations with guidance provided by Department's vision for unmanned systems.					
FY 2020 Base Plans:					
Release the FY19 Unmanned Systems Integrated Roadmap					
Update the Department's Unmanned Systems Integrated Roadmap and perform related studies supporting the Department's vision for unmanned systems.					
Integrate feedback, responses and new technology into the FY19 Roadmap.					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense				Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Investigate changes to concept of operations with guidance provided by Department's vision for unmanned systems.						
FY 2020 OCO Plans: N/A						
FY 2019 to FY 2020 Increase/Decrease Statement: The Unmanned systems roadmap is Developed and published every other year to provide the Department's vision for unmanned systems based on the rapid change in technology						
Accomplishments/Planned Programs Subtotals		0.170	0.330	0.249	0.000	0.249
C. Other Program Funding Summary (\$ in Millions) N/A						
Remarks						
D. Acquisition Strategy N/A						
E. Performance Metrics Provide up-to-date Unmanned Systems Roadmap providing a DoD vision for the continuing development, fielding and employment of unmanned systems technologies.						

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense												Date: February 2019			
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)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Unmanned Systems Roadmap	C/LH	Army TARDEC Unmanned System Support services : Army TARDEC	1.645	0.170	Aug 2018	0.330	Aug 2019	0.249		0.000		0.249		0.249	Continuing	Continuing	-
Subtotal			1.645	0.170		0.330		0.249		0.000		0.249		0.249	Continuing	Continuing	N/A

	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	1.645	0.170	0.330	0.249	0.000	0.249	Continuing	Continuing	N/A

Remarks
NA

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense			Date: February 2019
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	

	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Unmanned Systems Roadmap Development																												
Unmanned Systems Roadmap Development																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Office of the Secretary Of Defense			Date: February 2019
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

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Unmanned Systems Roadmap Development				
Unmanned Systems Roadmap Development	2	2018	4	2024

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 0604532D8Z I Joint Artificial Intelligence							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	0.000	0.000	12.970	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
006: Joint Artificial Intelligence	0.000	0.000	12.970	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The JAIC was established to preserve and expand our military advantage in support of the Department's 2018 National Defense Strategy. As a primarily executing body it will accelerate the delivery of Artificial Intelligence (AI) enabled capabilities, scale the Department-wide impact of AI, and synchronize DoD AI activities to expand Joint Force advantages. The JAIC mission is to accelerate the delivery of AI to achieve impact scaled across the DoD at relevant speed to transform the DoD and ensure the nation maintains a competitive advantage. JAIC capitalizes on Project Maven's efforts as the pathfinder AI initiative for the DoD to further critical AI architecture and prototyping to rapidly expand AI to other mission areas. As JAIC efforts prove relevant, they will expedite technology transition from the laboratory to operational use, and increase Joint Force capability. Most military data storage, utilization, and analytic tools and systems were designed pre-AI and require specialized integration to enable the insertion of algorithms into their software baseline. The JAIC will adopt or adapt commercial and government developed capabilities to improve warfighting and business processes.

JAIC will execute an initial sequence of AI implementations, called National Mission Initiatives (NMI), to demonstrate value and create momentum. NMIs are high-priority, pressing operational or business reform challenges. Additionally, JAIC will work closely with individual components to help identify, shape, and accelerate component-specific AI deployments, called Component Mission Initiatives (CMI). Both NMI and CMI efforts will include government, commercial, and academic partners to prototype and develop standardized processes with respect to data, testing and evaluation, and cybersecurity. JAIC will use lessons learned from these initial projects to establish new processes and standards that will be repeatable across additional projects and immediately relevant to the Joint Force. This will be done in collaboration with partners across technology companies, consulting firms, academia, government labs, Federally Funded Research and Development Centers (FFRDC), services, and international partners.

JAIC will scale use cases throughout the DoD in a manner that aligns with and leverages DoD enterprise cloud computing. It will establish a common foundation for scaling AI's impact across DoD, including shared data, reusable tools, frameworks and standards, and cloud and edge services. This will drive greater value by enabling consistency of approach, technology, and tools for all delivery-focused AI projects.

JAIC will foster shared lessons, and establish an enterprise approach while catalyzing efforts across DoD to enable more rapid and efficient prototyping and delivery of AI capabilities. JAIC will develop a governance framework and standards for AI development and delivery and collaborate within DoD, across government, and with industry, academia, and U.S. allies to strengthen partnerships, highlight critical needs, solve problems of urgent operational significance, and adapt AI technologies for DoD missions.

JAIC develops, tests, prototypes and demonstrates innovative AI, Machine Learning (ML), data infrastructure, and model/algorithm test and assessment capabilities to integrate AI capabilities across numerous domains and technical areas including maintenance and supply chain, personnel recovery, infrastructure assessment,

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0604532D8Z <i>I Joint Artificial Intelligence</i>
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geospatial monitoring during disaster, and cyber sense making. JAIC develops and evaluates integrated prototype technologies in realistic operating environments with DoD entities to assess the performance or cost reduction potential of applying such advanced technology to scale across multiple services. JAIC does this by aligning rapid prototype projects under NMIs and leverages existing commercial technology for DoD use, built upon a common architecture that enables the DoD to rapidly scale AI capability.

For the Predictive Maintenance NMI, JAIC uses artificial intelligence, deep learning, and predictive analytics to forecast major issues on the H-60 helicopter platform to better enable services to respond to upcoming failure. AI/ML will help identify component failure relationships to principle end items to predict critical failure prior to corrective maintenance and reactive supply chain requisitions. This will increase efficiency, decrease fleet operating and sustainment costs for equipment platforms, and reduce the time and costs associated with repair part requisition, management and transportation. Predictive maintenance will increase fleet operational readiness through reduced deadline or degradation time, particularly by preventing critical failure during missions, thereby providing certainty for availability and tasking to combatant commands and Joint Forces. This NMI will also apply AI and ML to optimize positioning of tools, parts, and personnel to provide the Joint Force with the best location to provide efficient and cost-effective repair and supply depots.

For the Humanitarian Aid and Disaster Relief NMI, JAIC will use computer vision algorithms to detect, classify, and identify distressed or missing personnel, predict forest fire patterns and burn rates, and flooding that impact human life and infrastructure. JAIC does this within FMV images (e.g., person, forest fire lines, flood lines, terrain and infrastructure changes) and other AI algorithms for text based projects to coordinate disaster relief efforts. JAIC algorithms increase the intelligence value of ISR, reduce the human burden of screening so analysts can multi-task increasing productivity, and seeds the generation of insight from multiple intelligence sources. This program is funded under Budget Activity 4, Demonstration and Validation.

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	0.000	0.000	0.000	-	0.000
Current President's Budget	0.000	12.970	0.000	-	0.000
Total Adjustments	0.000	12.970	0.000	-	0.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	13.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Joint Artificial Intelligence Center	-	-	0.000	-	0.000
• FFRDC Reduction	-	-0.030	-	-	-

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

Project: 006: *Joint Artificial Intelligence*

FY 2018	FY 2019

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>		R-1 Program Element (Number/Name) PE 0604532D8Z <i>I Joint Artificial Intelligence</i>	
Congressional Add Details (\$ in Millions, and Includes General Reductions) Congressional Add: <i>Joint Artificial Intelligence Center</i>		FY 2018	FY 2019
		0.000	12.970
Congressional Add Subtotals for Project: 006		0.000	12.970
Congressional Add Totals for all Projects		0.000	12.970
Change Summary Explanation FY 2018: N/A FY 2019: Congressional Increase 13.000 million; FFRDC Reduction -0.030 million. FY2020: N/A			
C. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
Congressional Add: Joint Artificial Intelligence Center		0.000	12.970
FY 2018 Accomplishments: NA			
FY 2019 Plans: JAIC will use rapid prototype sprints to field increasing predictive maintenance capability for the H-60 helicopter fleet across the Joint Force. JAIC will use data aggregation, artificial intelligence, deep learning, and predictive analytics algorithms to detect, correlate, and predict component failure and optimize supply chain solutions. This initiative brings artificial intelligence, deep learning, and predictive algorithms into the maintenance and supply business processes of H-60 fleet management, utilizing Joint Force readiness and supply data to process at machine speed versus human speed. JAIC will also use rapid prototype sprints to field capability to the Joint Force that enables better response to natural disasters, particularly those caused by wildfires and flooding, both common worldwide. Computer vision and algorithms will not only reduce the human burden and provide efficient and effective exploration of data, but provide insights and capability that humans alone currently do not have the capacity to manage. JAIC will develop algorithms focused on ISR and geospatial data to develop baseline GEOINT and infrastructure, then analyze changes to that baseline to best provide humanitarian aid and disaster relief. This will aid in the more efficient, effective, and quick recovery of distressed humans, identify damage to infrastructure, and assist relief efforts or evacuation and aid response. Overall, this effort will reduce risk to human life, critical infrastructure, and improve U.S. response in times of regional or global crises. This effort will integrate AI and ML to provide actionable intelligence and enhance military decision-making by providing algorithms for predictive algorithms, computer vision to identify critical information requirements, and user alerts. The JAIC will create a Joint Common Foundation (JCF) platform that will be crucial to the development, testing, and fielding of AI capabilities to the Department. This JCF will contain shared common components providing			

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>		R-1 Program Element (Number/Name) PE 0604532D8Z I <i>Joint Artificial Intelligence</i>	
C. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>NMIs/CMIs and the Department with the packages, frameworks, software, tools necessary to accelerate the adoption of AI-enabled capabilities. This includes the build out of AI platforms in a secure protected enclave hosted in a multi-cloud/multi-domain environment which provides NMIs/CMIs with compute, storage and security.</p> <p>The JCF platform supports scalable delivery of novel, impactful AI capability across DoD through the use of several key infrastructure elements. This infrastructure/environment will support each stage of the applied AI lifecycle, including: prototyping, integration, scaling, and support. The common foundation includes shared data, reusable tools, frameworks and standards, in addition to cloud and edge services. As the JAIC scales and the common foundation develops, entities across DOD will be able to both use and contribute to the infrastructure, leveraging the “factory” of artifacts. This will be done in collaboration with industry and government partners, including technology companies, consulting firms, academia, government labs, and Federally Funded Research and Development Centers (FFRDC), and across the Department.</p> <p>The JCF platform will promote information sharing and integration with Programs of Record by facilitating rapid deployment of AI capabilities into operational environments, military platforms and IT systems. JAIC will establish its Tier 2 (Mission/Business Processes) and Tier 3 (IS and PIT Systems) RMF governance structure to comply with DoDI 8510.01, Risk Management Framework (RMF) for DoD Information Technology (IT) and DoDI 8500.01, Cybersecurity. JAIC will appoint in writing officials to an organization CIO (Tier 2 position) and Authorizing Official (AO) and Authorizing Official Designated Representative (AODR) (Tier 3 positions) to meet the intend of DoD and OMB guidance.</p>			
Congressional Adds Subtotals		0.000	12.970
D. Other Program Funding Summary (\$ in Millions) N/A			
Remarks			
E. Acquisition Strategy N/A			
F. Performance Metrics JAIC performance metrics are measured through internal management controls and external assessments. Performance metrics include, but are not limited to time, money, realism, fidelity, and transition as defined below: • Time – Enable the warfighter to execute processes faster than current capabilities allow. This includes the ability to process more, or higher levels of relevant knowledge and apply human cognitive capital to higher order judgments on a faster pace than previously capable.			

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>		R-1 Program Element (Number/Name) PE 0604532D8Z <i>I Joint Artificial Intelligence</i>
<ul style="list-style-type: none"> • Money – Enable the warfighter to reduce duplication of effort and to prepare and execute events at a more effective and efficient cost than current capabilities allow. This includes finding efficiencies in system lifecycle management, supply chain, replacement and repair, and more accurate requisitions, saving critical limited fiscal resources to be applied appropriately. • Time – Enable the warfighter to execute processes faster than current capabilities allow. This includes the ability to process more, or higher levels of relevant knowledge and apply human cognitive capital to higher order judgments on a faster pace than previously capable. Field and transition relevant AI capabilities to the Department and build/iterate during sprint intervals. Enable real time/near-real time cohesive situational awareness and decision support at a pace faster than current manual aggregation and execution allow. • Money – Enable the warfighter to reduce duplication of effort and to prepare and execute events at a more effective and efficient cost than current capabilities allow. This includes finding efficiencies in system lifecycle management, supply chain, replacement and repair, and more accurate requisitions, saving critical limited fiscal resources to be applied appropriately. Decrease costs/increase efficiencies in supply chain, personnel requirements, IT systems and infrastructure, equipment maintenance, and auditability over current costs and levels of measurable efficiency. • Readiness – Increase fleet readiness of equipment and personnel availability aggregated to increase overall Joint Force readiness to better meet current, planned, or emerging Department mission and exercise requirements. • Fidelity – Ensure unity of effort throughout the Department and external stakeholders for national imperative focus areas, while catalyzing and accelerating AI capabilities beyond what was previously projected to be accomplished during that time period. Provide relevant and scalable AI capabilities via agile sprint events that enables the Joint Force to build upon, iterate on, and implement relevant AI capabilities to meet specific operational or business needs when the Department needs them to maintain competitive advantage. • Transition – Select projects that have the greatest likelihood of adoption and transition to operational capabilities. Field capabilities that the Department has planned to implement and is ready to implement into new or existing programs of record within the FYDP. 		

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense												Date: February 2019			
Appropriation/Budget Activity 0400 / 4						R-1 Program Element (Number/Name) PE 0604532D8Z / <i>Joint Artificial Intelligence</i>				Project (Number/Name) 006 / <i>Joint Artificial Intelligence</i>					
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Technical Engineering Services	C/Various	Various : Various	-	-		12.970	Jul 2019	-		-		-	Continuing	Continuing	-
Subtotal			-	-		12.970		-		-		-	Continuing	Continuing	N/A
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			-	-		12.970		-		-		-	Continuing	Continuing	N/A
Remarks															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense

Date: February 2019

Appropriation/Budget Activity	R-1 Program Element (Number/Name)	Project (Number/Name)
0400 / 4	PE 0604532D8Z / Joint Artificial Intelligence	006 / Joint Artificial Intelligence

	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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 Artificial Intelligence 006																												
FY19 Project Execution																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604532D8Z / <i>Joint Artificial Intelligence</i>	Project (Number/Name) 006 / <i>Joint Artificial Intelligence</i>
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Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>Joint Artificial Intelligence 006</i>				
FY19 Project Execution	1	2019	2	2020

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity					R-1 Program Element (Number/Name)							
0400: Research, Development, Test & Evaluation, Defense-Wide / BA 4: Advanced Component Development & Prototypes (ACD&P)					PE 0604682D8Z / Wargaming & Support for Strategic Analysis (SSA)							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	3.850	3.686	3.759	3.751	-	3.751	3.748	3.810	3.880	3.963	Continuing	Continuing
104: Wargaming & Support for Strategic Analysis	3.850	3.686	3.759	3.751	-	3.751	3.748	3.810	3.880	3.963	Continuing	Continuing

A. Mission Description and Budget Item Justification

A. Mission Description and Budget Item Justification

This program supports the Office of the Director, Cost Assessment & Program Evaluation (CAPE) by funding activities that help CAPE to implement the Department's intent to reinvigorate wargaming. CAPE accomplishes this by leading wargaming activities, developing and managing the Wargaming Portal, and supporting the design, execution, and analysis of wargames. This was a new start program in FY 2017.

This program provides for analytical research across a spectrum of 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 from wargaming excursions. Outcomes include the compilation and analysis of wargaming data in the Wargaming Portal and support for data use by wargaming participants.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0604682D8Z I <i>Wargaming & Support for Strategic Analysis (SSA)</i>
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B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	3.686	3.768	3.751	-	3.751
Current President's Budget	3.686	3.759	3.751	-	3.751
Total Adjustments	0.000	-0.009	0.000	-	0.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• FFRDC Reduction	-	-0.009	-	-	-

Change Summary Explanation

This program was added In FY 2017 to reinvigorate Wargaming and Support for Strategic Analysis to implement an important Deputy Secretary of Defense priority. The FY 2020 reduction reflects the . . .

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
104: Wargaming & Support for Strategic Analysis	3.850	3.686	3.759	3.751	-	3.751	3.748	3.810	3.880	3.963	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

⁽⁺⁾ The sum of all Prior Years is \$0.000 million less than the represented total due to several projects ending

A. Mission Description and Budget Item Justification

A. Mission Description and Budget Item Justification

This program supports the Office of the Director, Cost Assessment & Program Evaluation (CAPE). It funds activities that help CAPE to implement the vision of the Deputy Secretary of Defense to reinvigorate wargaming in the Department of Defense. CAPE will accomplish this by leading wargaming activities; developing and managing the Wargaming Portal, and supporting the design, execution, and analysis of wargames.

This program provides for analytical research across a spectrum of issues and concerns. The research agenda is focused on near to long-term problems identified by the Deputy Secretary of Defense, and addresses difficult and complex questions linked to program alternatives for current and future capabilities and forces in order to enhance the senior leadership's deliberations and decision-making.

This program provides the scientific and technical engineering services needed for research studies in the development of models and simulations and the evaluation of current analytical tools and scientific methods used to evaluate and assess scenarios and concepts of operations (CONOPS) for a wide range of warfighting environments and scenarios. Deliverables from this program will include reports, briefings, and analyses designed to illuminate findings and assessments from wargaming excursions. Outcomes include the compilation and analysis of wargaming data in the Wargaming Portal and support for data use by wargaming participants.

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)

	FY 2018	FY 2019	FY 2020
Title: Wargaming & Support for Strategic Analysis	3.686	3.759	3.751
Articles:	1	1	1
Description: This program provides for analytical research across a spectrum of issues and concerns. The research agenda is focused on near- to long-term problems identified by the Deputy Secretary of Defense, and addresses difficult and complex questions linked to program alternatives for current and future capabilities and forces in order to enhance the senior leadership's deliberations and decision-making.			
FY 2019 Plans: Studies, analyses, and assessments will be focused on: <ul style="list-style-type: none"> - Developing and refining wargaming objectives from senior leader priorities and Strategic Support Analysis activities. - Overseeing planning, design, and scheduling of additional excursion wargames 			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604682D8Z / <i>Wargaming & Support for Strategic Analysis (SSA)</i>	Project (Number/Name) 104 / <i>Wargaming & Support for Strategic Analysis</i>	
B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)		FY 2018	FY 2019
<ul style="list-style-type: none"> - Leading, participating in, and assessing outcomes of all excursion wargames - Participating in some near-, mid-, and far-term scenarios and CONOPS wargames - Analyzing wargame insights and data in the Wargaming Repository. - Providing ongoing requirements for the Wargaming Portal as needed - Providing guidance to DoD on best practices for mid-term wargames. <p><i>FY 2020 Plans:</i> Studies, analyses, and assessments will be focused on:</p> <ul style="list-style-type: none"> - Developing and refining wargaming objectives from senior leader priorities and Strategic Support Analysis activities. - Overseeing planning, design, and scheduling of additional excursion wargames - Leading, participating in, and assessing outcomes of all excursion wargames - Participating in some near-, mid-, and far-term scenarios and CONOPS wargames - Analyzing wargame insights and data in the Wargaming Repository. - Providing ongoing requirements for the Wargaming Portal as needed - Providing guidance to DoD on best practices for mid-term wargames. <p><i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> FY 2019 maintains a virtual steady-state level of effort to support senior DoD leadership requirements.</p>			
Accomplishments/Planned Programs Subtotals		3.686	3.759
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).			
E. Performance Metrics			
The products or expected outcomes of this program are studies and analyses to support issues of high interest to the Deputy Secretary of Defense. Products will also include the Wargaming Repository to provide a knowledge base for the Department of Defense. Performance is measured by the quality of the analyses and is monitored through the review of the organizational assessment process. The primary goal is to ensure that study and analytical products are timely, clear, complete, accurate, responsive, balanced, and objective.			

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense												Date: February 2019			
Appropriation/Budget Activity 0400 / 4						R-1 Program Element (Number/Name) PE 0604682D8Z / <i>Wargaming & Support for Strategic Analysis (SSA)</i>						Project (Number/Name) 104 / <i>Wargaming & Support for Strategic Analysis</i>			
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Wargaming & Support for Strategic Analysis	C/Various	Various : DC Metro Area	3.850	3.686	Jan 2018	3.759	Jan 2019	3.751	Jan 2020	-		3.751	Continuing	Continuing	N/A
Subtotal			3.850	3.686		3.759		3.751		-		3.751	Continuing	Continuing	N/A
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			3.850	3.686		3.759		3.751		-		3.751	Continuing	Continuing	N/A
Remarks CAPE will accomplish this program by leading wargaming activities; developing and managing the Wargaming Portal, and supporting the design, execution, and analysis of wargames. Funds will be awarded for high-priority projects based on competition, and the awards will include analysis of proposed costs.															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense			Date: February 2019
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	

	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Wargaming & Support for Strategic Analysis																												
Wargaming & Support for Strategic Analysis																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Office of the Secretary Of Defense			Date: February 2019
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

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Wargaming & Support for Strategic Analysis				
Wargaming & Support for Strategic Analysis	1	2018	4	2023

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity					R-1 Program Element (Number/Name)							
0400: Research, Development, Test & Evaluation, Defense-Wide / BA 4: Advanced Component Development & Prototypes (ACD&P)					PE 0604775D8Z / Defense Rapid Innovation Program							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	250.000	249.432	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
775: Defense Rapid Innovation Program	-	250.000	249.432	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

A. Mission Description and Budget Item Justification

The Defense Rapid Innovation Fund (RIF) Program was established in Section 1073 of the FY 2011 National Defense Authorization Act (NDAA) and authorized as a permanent program in the FY 2017 NDAA. The RIF Program accelerates the fielding of innovative technologies into military systems via a competitive, merit-based selection process. Technology innovations are drawn from Phase II Small Business Innovative Research (SBIR) projects, defense laboratory and academia efforts, and other innovative technologies, including dual-use and Independent Research & Development (IRAD) technologies. Projects stimulate innovation, mitigate technical risks, reduce acquisition and/or lifecycle costs, improve test outcomes, and rapidly insert technology into major acquisition programs and other programs that meet critical national security needs. RIF provides a mechanism for bridging the "Valley of Death" by funding the integration work vital to transition technologies out of the laboratory and into Programs of Record. Since inception, RIF has evaluated over 18,000 industry submitted white papers and funded over 800 projects with companies from 43 different states across the 30 different organizations in the Military Services, Combatant Commands, and other Defense Agencies.

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	0.000	0.000	0.000	-	0.000
Current President's Budget	250.000	249.432	0.000	-	0.000
Total Adjustments	250.000	249.432	0.000	-	0.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	250.000	250.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• FFRDC Reduction	-	-0.568	-	-	-

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

Project: 775: Defense Rapid Innovation Program

Congressional Add: Defense Rapid Innovation Fund

Congressional Add Subtotals for Project: 775

FY 2018	FY 2019
250.000	249.432
250.000	249.432

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0604775D8Z I <i>Defense Rapid Innovation Program</i>		
Congressional Add Details (\$ in Millions, and Includes General Reductions)			
<div style="text-align: right; padding-right: 20px;">Congressional Add Totals for all Projects</div>		FY 2018 250.000	FY 2019 249.432

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 4					R-1 Program Element (Number/Name) PE 0604775D8Z / Defense Rapid Innovation Program				Project (Number/Name) 775 / Defense Rapid Innovation Program			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
775: Defense Rapid Innovation Program	-	250.000	249.432	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

From FY 2011 thru FY 2018, the RIF Program has been funded through Congressional Adds.

RIF funds are distributed evenly between the Services (Army, Navy, and Air Force) and the other Defense agencies. RIF is executed via a competitive two-step process for participation in the program. Industry is invited to submit three-page white papers plus a quad chart through an annual Broad Agency Announcement. Once white papers have been reviewed, the highest ranking white papers are invited to submit full detailed proposals for funding consideration. In ranking white papers, preference will be given to projects focusing on the Research and Engineering top 10 research priorities, the National Defense Strategy, and small businesses. Full proposals are subject to final review and the highest ranking proposals are selected for contract award. The statute for RIF defines project scope as not to exceed 24 months and \$3.000 million per project.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019
Congressional Add: Defense Rapid Innovation Fund	250.000	249.432
FY 2018 Accomplishments: In first quarter FY 2018, a department-wide call for technology requirement topics was issued. In second quarter FY 2018, Washington Headquarters Services issued a consolidated FY 2018 RIF Broad Agency Announcement (BAA) containing over 280 technology requirement topics from the Military Services, Combatant Commands, and other Defense Agencies. In third and fourth quarters FY 2018, over 1,800 industry white papers were received and reviewed. Approximately 120 FY 2018 RIF contract awards are anticipated by end of third quarter FY 2019.		
FY 2019 Plans: The Department-wide call for technology requirement topics will be issued in first quarter FY 2019. The BAA is planned for second quarter FY 2019. Final project selections will be made by third quarter FY 2019 and awarded by December 2019.		
Congressional Adds Subtotals	250.000	249.432

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

N/A

Remarks

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604775D8Z / <i>Defense Rapid Innovation Program</i>	Project (Number/Name) 775 / <i>Defense Rapid Innovation Program</i>
D. Acquisition Strategy Successful RIF projects can transition to acquisition via several ways including, but not limited to: technology upgrade insertion into a current platform or program providing greater capability or prolonging the life of the weapon system; informing/refining future requirements providing better outcomes for planned systems; or a direct transition/procurement should the item/article provide a new capability.		
E. Performance Metrics Each RIF project is evaluated at its conclusion based on two measures: 1) technical performance, or extent the RIF project is meeting its technical goals, with an assessment of cost, schedule, and deliverables against stated objectives; and 2) transition status, or the extent to which an acquisition program or customer has been identified and is participating in procuring the technology, assuming the RIF project is successful.		

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense												Date: February 2019			
Appropriation/Budget Activity 0400 / 4						R-1 Program Element (Number/Name) PE 0604775D8Z / Defense Rapid Innovation Program				Project (Number/Name) 775 / Defense Rapid Innovation Program					
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
RIF Project Awards	C/Various	Multiple : Multiple	-	245.475		245.469		-		-		-	Continuing	Continuing	-
Subtotal			-	245.475		245.469		-		-		-	Continuing	Continuing	N/A
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Intramural Support Costs	MIPR	Army, Navy, and Air Force : Multiple	-	3.500		3.413		-		-		-	Continuing	Continuing	-
Subtotal			-	3.500		3.413		-		-		-	Continuing	Continuing	N/A
Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
RIF Program Support Services and Portal Costs	C/Various	Multiple : Multiple	-	1.025		0.550		-		-		-	Continuing	Continuing	-
Subtotal			-	1.025		0.550		-		-		-	Continuing	Continuing	N/A
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			-	250.000		249.432		-		-		-	Continuing	Continuing	N/A
Remarks Administrative costs for executing RIF, program-wide, are two percent of the total appropriation per fiscal year.															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604775D8Z / <i>Defense Rapid Innovation Program</i>	Project (Number/Name) 775 / <i>Defense Rapid Innovation Program</i>
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FY 2018 Schedule

November – December 2018	<ul style="list-style-type: none"> Review vendor full proposals
January – February 2019	<ul style="list-style-type: none"> Review and approve project spend plans Prepare financial documents
June 2019	<ul style="list-style-type: none"> Complete contract awards for FY 2018 (goal)
July – September 2019	<ul style="list-style-type: none"> Process reallocation awards

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0604775D8Z / <i>Defense Rapid Innovation Program</i>	Project (Number/Name) 775 / <i>Defense Rapid Innovation Program</i>
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FY 2019 Schedule	
November 2018	<ul style="list-style-type: none"> • Requirements consolidation
December 2018 – February 2019	<ul style="list-style-type: none"> • BAA advertised on FEDBIZOPPS
February – April 2019	<ul style="list-style-type: none"> • Review white papers • Source Selection Review Boards meet
30 April 2019	<ul style="list-style-type: none"> • Notify submitters • Invite full proposals
May – June 2019	<ul style="list-style-type: none"> • Review and approve project spend plans • Prepare financial documents
October 2019	<ul style="list-style-type: none"> • Begin to issue contract awards
December 2019	<ul style="list-style-type: none"> • Complete contract awards for FY 2019 (goal)

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity					R-1 Program Element (Number/Name)							
0400: Research, Development, Test & Evaluation, Defense-Wide I BA 4: Advanced Component Development & Prototypes (ACD&P)					PE 0303191D8Z I Joint Electromagnetic Technology (JET) Program							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	11.089	2.896	3.097	3.191	-	3.191	3.237	3.284	3.346	3.346	Continuing	Continuing
192: Joint Electromagnetic Technology (JET) Program	11.089	2.896	3.097	3.191	-	3.191	3.237	3.284	3.346	3.346	Continuing	Continuing

A. Mission Description and Budget Item Justification

The JET Program supports the Defense Community in general with a particular emphasis on the communication requirements of Special Forces and Intelligence. Details of the program are classified. This program is funded under Budget Activity 4, Demonstration and Validation.

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	2.902	3.104	3.191	-	3.191
Current President's Budget	2.896	3.097	3.191	-	3.191
Total Adjustments	-0.006	-0.007	0.000	-	0.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• FFRDC Reduction	-0.006	-0.007	-	-	-

Change Summary Explanation

FY 2018: FFRDC Reduction -0.006 million.
FY 2019: FFRDC Reduction -0.007 million..
FY 2020: No change.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 4					R-1 Program Element (Number/Name) PE 0303191D8Z / <i>Joint Electromagnetic Technology (JET) Program</i>				Project (Number/Name) 192 / <i>Joint Electromagnetic Technology (JET) Program</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
192: <i>Joint Electromagnetic Technology (JET) Program</i>	11.089	2.896	3.097	3.191	-	3.191	3.237	3.284	3.346	3.346	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		
A. Mission Description and Budget Item Justification The JET Program supports the Defense Community in general with a particular emphasis on the communication requirements of Special Forces and Intelligence. Details of the program are classified. This program is funded under Budget Activity 4, Demonstration and Validation.												
B. Accomplishments/Planned Programs (\$ in Millions)									FY 2018	FY 2019	FY 2020	
Title: JET Program Initiatives									2.896	3.097	3.191	
FY 2019 Plans: Program Planning and Support												
FY 2020 Plans: Program Planning and Support												
FY 2019 to FY 2020 Increase/Decrease Statement: Program Growth												
Accomplishments/Planned Programs Subtotals									2.896	3.097	3.191	
C. Other Program Funding Summary (\$ in Millions) N/A Remarks D. Acquisition Strategy N/A E. Performance Metrics - Numbers of operational field demonstrations. - Numbers of false-positive results. - Successful technology transfer to service component. - Number of service requirements satisfied.												

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense												Date: February 2019			
Appropriation/Budget Activity 0400 / 4						R-1 Program Element (Number/Name) PE 0303191D8Z / <i>Joint Electromagnetic Technology (JET) Program</i>						Project (Number/Name) 192 / <i>Joint Electromagnetic Technology (JET) Program</i>			
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Technical Engineering Services	Option/ FFP	Various : Various	11.089	1.000	Jul 2018	1.000	Jul 2019	1.200	Jul 2020	-		1.200	Continuing	Continuing	-
Subtotal			11.089	1.000		1.000		1.200		-		1.200	Continuing	Continuing	N/A
Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Program Management Support	C/Various	Various : Various	-	1.000	Jul 2018	1.100	Jul 2019	1.200	Jul 2020	-		1.200	Continuing	Continuing	-
Engineering Support FFRDC	Option/ Various	Various : Various	-	0.896	Jul 2018	0.997	Jul 2019	0.791	Jul 2020	-		0.791	Continuing	Continuing	-
Subtotal			-	1.896		2.097		1.991		-		1.991	Continuing	Continuing	N/A
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			11.089	2.896		3.097		3.191		-		3.191	Continuing	Continuing	N/A
Remarks NA															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0303191D8Z / <i>Joint Electromagnetic Technology (JET) Program</i>	Project (Number/Name) 192 / <i>Joint Electromagnetic Technology (JET) Program</i>
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R4								
PE: 0303191D8Z/ Joint Electromagnetic Technology								
Funding supports the development of Joint Electromagnetic Technologies (JET) that support DoD Special communications and communications assurance.								
	10/1/2018	10/1/2019	10/1/2020	10/1/2021	10/1/2022	10/1/2023	10/1/2024	10/1/2025
FY2018 Program Execution								
FY2019 Program Execution								
FY2020 Program Execution								
FY2021 Program Execution								
FY2022 Program Execution								
FY2023 Program Execution								
FY2024 Program Execution								

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Office of the Secretary Of Defense			Date: February 2019
Appropriation/Budget Activity 0400 / 4	R-1 Program Element (Number/Name) PE 0303191D8Z / <i>Joint Electromagnetic Technology (JET) Program</i>	Project (Number/Name) 192 / <i>Joint Electromagnetic Technology (JET) Program</i>	

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
*** SUBPROJECT TITLE ***				
FY19 Project Execution	1	2019	2	2020
FY20 Project Execution	1	2020	2	2021
FY21 Project Execution	1	2021	2	2022
FY22 Project Execution	1	2022	2	2023
FY23 Project Execution	1	2023	2	2024

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

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/Countering Nuclear Threats
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	61.180	12.320	8.314	11.276	-	11.276	7.386	6.321	6.434	6.499	Continuing	Continuing
163: Nuclear and Conventional Physical Security	49.462	12.320	3.914	7.855	-	7.855	7.286	6.321	6.434	6.499	Continuing	Continuing
042: CNT Prevention SDD	11.718	0.000	4.400	3.421	-	3.421	0.100	0.000	0.000	0.000	Continuing	Continuing

Note

The FY2019 funding request was reduced by \$3.461 million to account for the availability of prior year execution balances with payback in FY20 & FY21.

Please note: FY 2018 funding, within internal financial system, was erroneously combined within project code 163 (\$12.320) versus the proper breakout between project codes 163 (\$7.223) and 042 (\$5.097). The internal system cannot be changed at this time preventing us from reporting the actual cost breakdown.

A. Mission Description and Budget Item Justification

This Program Element (PE) addresses the need to defend and deter against weapons of mass destruction (WMD) 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 throughout DoD for an integrated and systemic RDT&E approach for countering nuclear threats and nuclear and conventional physical security technology and systems. The funding has been centralized in this Defense-wide PE since the early 1990s and represents a substantial portion of all DoD physical security RDT&E funding. Priorities for this PE RDT&E efforts are driven by inputs from Quadrennial Defense Review guidance, Combatant Command and Service requirements, analysis reports such as "Protecting the Force: Lessons from Fort Hood," January 2010, the Integrated Unit, Base, and Installation Protection Cost Benefits Analysis, Multi-national Work Plans established through the Nuclear Security Summit process, and DoD Directive 5210.41, Security Policy for Protecting Nuclear Weapons-directed requirements and associated security deviation reports.

Under this integrated approach, funds are used to provide system development and demonstration for the Department in 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 program will develop systems that are producible, supportable, and affordable and to demonstrate system integration, interoperability, and utility prior to full-rate production. The projects under the PE become technology insertions into existing programs or advance to being a certified Commercial/Government off-the-shelf product. The PE initiatives are coordinated by the Physical Security Enterprise and Analysis Group. This group is responsible for avoiding duplication of effort and when applicable ensure systems integration and promote interoperability and sustainability.

This PE 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),

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 5: System Development & Demonstration (SDD)</i>	R-1 Program Element (Number/Name) PE 0604161D8Z I <i>Nuclear and Conventional Physical Security/Countering Nuclear Threats</i>
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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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	12.536	8.333	11.699	-	11.699
Current President's Budget	12.320	8.314	11.276	-	11.276
Total Adjustments	-0.216	-0.019	-0.423	-	-0.423
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.192	-			
• FFRDC	-0.024	-0.019	-	-	-
• INV-D-032 CBDP Bio-Chem Threats Preparedness Reduction	-	-	-0.423	-	-0.423

Change Summary Explanation

Depending on the stages of individual projects funding will transition between RDT&E and procurement program elements.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 5					R-1 Program Element (Number/Name) PE 0604161D8Z / Nuclear and Conventional Physical Security/Countering Nuclear Threats				Project (Number/Name) 163 / Nuclear and Conventional Physical Security			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
163: Nuclear and Conventional Physical Security	49.462	12.320	3.914	7.855	-	7.855	7.286	6.321	6.434	6.499	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Please note: FY 2018 funding, within internal financial system, was erroneously combined within project code 163 (\$12.320) versus the proper breakout between project codes 163 (\$7.223) and 042 (\$5.097). The internal system cannot be changed at this time preventing us from reporting the actual cost breakdown.

A. Mission Description and Budget Item Justification

This Program Element (PE) addresses the need to defend and deter against weapons of mass destruction (WMD) 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 throughout DoD for an integrated and systemic RDT&E approach for countering nuclear threats and nuclear and conventional physical security technology and systems. The funding has been centralized in this Defense-wide PE since the early 1990s and represents a substantial portion of all DoD physical security RDT&E funding. Priorities for this PE RDT&E efforts are driven by inputs from Quadrennial Defense Review guidance, Combatant Command and Service requirements, analysis reports such as "Protecting the Force: Lessons from Fort Hood," January 2010, the Integrated Unit, Base, and Installation Protection Cost Benefits Analysis, Multi-national Work Plans established through the Nuclear Security Summit process, and DoD Directive 5210.41, Security Policy for Protecting Nuclear Weapons-directed requirements and associated security deviation reports.

Under this integrated approach, funds are used to provide system development and demonstration for the Department in 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 program will develop systems that are producible, supportable, and affordable and to demonstrate system integration, interoperability, and utility prior to full-rate production. The projects under the PE become technology insertions into existing programs or advance to being a certified Commercial/Government off-the-shelf product. The PE initiatives are coordinated by the Physical Security Enterprise and Analysis Group. This group is responsible for avoiding duplication of effort and when applicable ensure systems integration and promote interoperability and sustainability.

This PE 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), 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.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0604161D8Z / Nuclear and Conventional Physical Security/Countering Nuclear Threats	Project (Number/Name) 163 / Nuclear and Conventional Physical Security		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
Title: Detection and Assessment 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. FY 2019 Plans: <ul style="list-style-type: none">• Test and evaluate a Joint Interoperable Gateway for Security, Anti-terrorism and Warfighting command control display equipment capable of integrating/supporting the designated USAF physical security sensor and communication module• Test and evaluate commercial-off-the-shelf Indoor Gunshot Detection technologies in applications within DoD facilities• Develop Trace Explosive Detection System Improvement• Test and Evaluate Colorimetric Systems FY 2020 Plans: <ul style="list-style-type: none">• Continue to test and evaluate commercial-off-the-shelf Indoor Gunshot Detection technologies in applications within DoD facilities• Continue to test and evaluate a Joint Interoperable Gateway for Security, Anti-terrorism and Warfighting command control display equipment capable of integrating/supporting the designated USAF physical security sensor and communication module. FY 2019 to FY 2020 Increase/Decrease Statement: Projects and project cost vary from year to year		4.700	2.137	4.620
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. FY 2019 Plans: <ul style="list-style-type: none">• No current projects are being planned in this area FY 2020 Plans: <ul style="list-style-type: none">• No current projects are being planned in this area FY 2019 to FY 2020 Increase/Decrease Statement: Projects and project cost vary from year to year		0.000	0.000	0.000
Title: Installation and Transport Security		0.000	0.329	0.614

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0604161D8Z / <i>Nuclear and Conventional Physical Security/Countering Nuclear Threats</i>	Project (Number/Name) 163 / <i>Nuclear and Conventional Physical Security</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>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.</p> <p>FY 2019 Plans:</p> <ul style="list-style-type: none"> • Development of Stabilized Crew-Served Heavy Machine Gun Mount <p>FY 2020 Plans:</p> <ul style="list-style-type: none"> • Continue development of Stabilized Crew-Served Heavy Machine Gun Mount <p>FY 2019 to FY 2020 Increase/Decrease Statement: Projects and project cost vary from year to year</p>			
<p>Title: Prevention</p> <p>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.</p> <p>FY 2019 Plans:</p> <ul style="list-style-type: none"> • Continue to develop a counter Unmanned Underwater / Surface / Ground Vehicle technology roadmap <p>FY 2020 Plans:</p> <ul style="list-style-type: none"> • Continue efforts with the Stand-Off Weapon Defeat Integrated Product Team <p>FY 2019 to FY 2020 Increase/Decrease Statement: Projects and project cost vary from year to year</p>		0.927	0.639
<p>Title: Storage and Safeguards</p> <p>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.</p> <p>FY 2019 Plans:</p>		0.000	0.000
		0.000	0.000

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0604161D8Z / Nuclear and Conventional Physical Security/Countering Nuclear Threats	Project (Number/Name) 163 / Nuclear and Conventional Physical Security		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
• No current projects are being planned in this area FY 2020 Plans: • No current projects are being planned in this area FY 2019 to FY 2020 Increase/Decrease Statement: There were no changes				
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 and projects related to the creation and enhancement of common operating pictures, and the establishment of common architectures / interface standards. FY 2019 Plans: • Continue to develop Response Force Command, Control & Communications • Continue to develop C2 Enhanced Capability Suite FY 2020 Plans: • Continue to monitor the test & evaluation of various Physical Security Technologies being developed by the Physical Security Enterprise and Analysis Group and other organizations. FY 2019 to FY 2020 Increase/Decrease Statement: Projects and project cost vary from year to year		0.453	0.136	0.550
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. FY 2019 Plans: • Conduct physical security test and evaluation efforts • Provide DOD and industry the means to achieve PSE interoperability FY 2020 Plans:		1.143	0.673	1.050

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0604161D8Z / <i>Nuclear and Conventional Physical Security/Countering Nuclear Threats</i>	Project (Number/Name) 163 / <i>Nuclear and Conventional Physical Security</i>	

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
<ul style="list-style-type: none"> • Research, develop and test interoperability bridges for the Security Equipment Integration Working Group (SEIWG) and Integrated Sensor Architecture (ISA) based interface standards <p><i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> Projects and project cost vary from year to year</p> <p><i>Title:</i> CNT Rad/Nuc Passive Defense</p> <p><i>Description:</i> Advanced Development of Joint Radiological and Nuclear passive defense systems (i.e. Radiological Detection System and the Joint Personal Dosimeter).</p> <p>The Radiological Detection System will provide a ruggedized Radiation Detection, Indication, and Computation for real time gamma radiation monitoring and low energy x-ray, beta, alpha, and neutron detection.</p> <p>The Joint Personal Dosimeter will provide a joint solution to increase capability and reduce life-cycle costs.</p> <p>Both systems will address Operation TOMODACHI (response to Japan's Fukushima Daiichi nuclear power plant incident) lessons learned for common, interoperable equipment with adequate sensitivity and common units of measure.</p>	5.097	-	-
Accomplishments/Planned Programs Subtotals	12.320	3.914	7.855

C. Other Program Funding Summary (\$ in Millions) N/A Remarks NA
D. Acquisition Strategy N/A
E. Performance Metrics The program performance metrics are established/approved through the Office of the Deputy Assistant Secretary of Defense for Nuclear, Chemical, and Biological Defense Programs / Nuclear Matters. The cost, schedule and technical progress of each project is reviewed at quarterly PSEAG. Performance variances are addressed and corrective action is implemented as necessary.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense												Date: February 2019			
Appropriation/Budget Activity 0400 / 5						R-1 Program Element (Number/Name) PE 0604161D8Z / Nuclear and Conventional Physical Security/Countering Nuclear Threats						Project (Number/Name) 163 / Nuclear and Conventional Physical Security			

Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
National Information Exchange Model	Various	SPAWAR Atlantic : Charleston, SC	0.474	-		-		-		-		-	Continuing	Continuing	-
Military Ocean Terminal	Various	Various : Various	0.285	-		-		-		-		-	-	-	-
Force Protection Cross-Domain	MIPR	PEO IEW&S : Ft Belvoir, VA	0.466	-		-		-		-		-	Continuing	Continuing	-
Tactical Security System	MIPR	PEO IEW&S : Ft Belvoir, MD	0.317	-		-		-		-		-	Continuing	Continuing	-
C2 Enhanced Capability Suite	MIPR	SPAWAR Pacific : Various	0.650	0.070		-		-		-		-	Continuing	Continuing	-
Foliage Penetration	MIPR	Various : Various	0.187	-		-		-		-		-	Continuing	Continuing	-
ESS Cyber Security Assessment	MIPR	Various : Various	0.261	-		-		-		-		-	Continuing	Continuing	-
Indoor Gunshot Detection System	MIPR	SPAWAR Atlantic : Charleston, SC	0.427	0.291		0.208		0.208		-		0.208	-	-	-
Physical Security RDT&E	Various	Various : Various	42.731	0.123		-		-		-		-	Continuing	Continuing	-
Interoperability Standards	MIPR	SPAWAR Atlantic : Charleston, SC	-	1.346		-		-		-		-	Continuing	Continuing	-
Trace Explosive Detection System Improvement	MIPR	EOD Tech Division : Indian Head, MD	-	0.526		0.826		0.829		-		0.829	-	-	-
Integrating MANTAS USA with NUTR COP	MIPR	SPAWARSYSCEN Pacific : San Diego, CA	-	0.249		-		-		-		-	-	-	-
Detection & Assessment	Various	Various : Various	-	-		-		2.476		-		2.476	Continuing	Continuing	-
Access Control	Various	Various : Various	-	-		-		-		-		-	Continuing	Continuing	-
Storage & Safeguards	Various	Various : Various	-	-		-		-		-		-	Continuing	Continuing	-
Analytical Support	Various	Various : Various	-	-		-		1.119		-		1.119	Continuing	Continuing	-
Decision Support	Various	Various : Various	-	-		-		0.298		-		0.298	Continuing	Continuing	-
Prevention	Various	Various : Various	-	-		-		0.128		-		0.128	Continuing	Continuing	-
Installation & Transport Security	Various	Various : Various	-	-		-		-		-		-	Continuing	Continuing	-

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0604161D8Z / Nuclear and Conventional Physical Security/Countering Nuclear Threats	Project (Number/Name) 163 / Nuclear and Conventional Physical Security
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Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Stablized Crew-Served Heavy Machine Gun Mount	MIPR	NSWC Crane : Crane, IN	-	-		0.329		0.614		-		0.614	Continuing	Continuing	-
JIGSAW - TASS Integration	MIPR	Multiply Performers : Multiple Locations	-	0.776		0.607		0.569		-		0.569	Continuing	Continuing	-
Radiological Detection System	Sub Allot	JPEO CBD : Aberdeen, MD	-	5.097		-		-		-		-	Continuing	Continuing	-
Subtotal			45.798	8.478		1.970		6.241		-		6.241	Continuing	Continuing	N/A

Remarks

NA

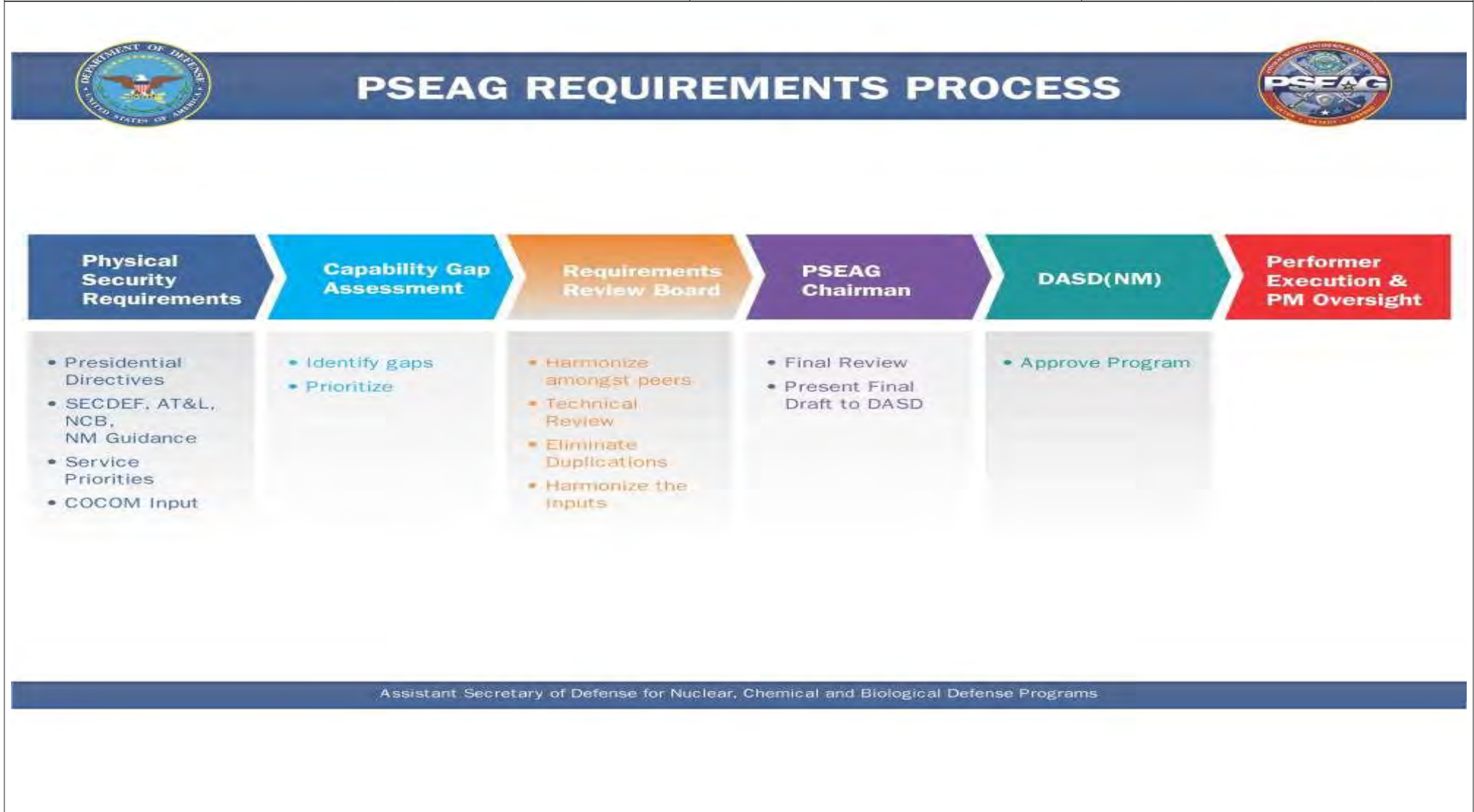
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
PSEAG T&E	MIPR	SPAWAR Atlantic : Charleston, SC	0.650	0.123		0.123		-		-		-	Continuing	Continuing	-
Comparative Evaluation of Man-Portable Mass Spectrometry Explosive Detection Systems	MIPR	EOD Tech Division : Indian Head, MD	0.918	-		-		-		-		-	-	-	-
Comparative Colorimetric	MIPR	EOD Tech Division : Indian Head, MD	0.978	0.172		0.998		0.669		-		0.669	-	-	-
Detection of Insensitive Munitions	MIPR	EOD Tech Division : Indian Head, MD	0.465	-		-		-		-		-	-	-	-
Development, Test and Evaluation of System Operations Audit and Recording	MIPR	SPAWAR Atlantic : Charleston, SC	0.653	-		-		-		-		-	-	-	-
Explosive Vapor Detection Test & Evaluation	MIPR	EOD Tech Division : Indian Head, MD	-	0.603		-		-		-		-	-	-	-

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense												Date: February 2019			
Appropriation/Budget Activity 0400 / 5						R-1 Program Element (Number/Name) PE 0604161D8Z / Nuclear and Conventional Physical Security/Countering Nuclear Threats				Project (Number/Name) 163 / Nuclear and Conventional Physical Security					
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Raman Comparative	MIPR	EOD Tech Division : Indian Head, MD	-	0.713		-		-		-		-	-	-	-
Radiological Detection System	Sub Allot	JPEO CBD : Aberdeen, MD	-	0.248		-		-		-		-	-	-	-
Stand-Off Weapon Defeat IPT	MIPR	NSWC Dahlgren Division : Dahlgren Division	-	1.231		0.203		0.693		-		0.693	-	-	-
PSEAG Test & Evaluation	MIPR	Multiple Performers : Multiple Performers	-	-		-		0.252		-		0.252	Continuing	Continuing	-
C-UAS in the Homeland	MIPR	Multiple Performers : Multiple Locations	-	0.752		0.620		-		-		-	Continuing	Continuing	-
Subtotal			3.664	3.842		1.944		1.614		-		1.614	Continuing	Continuing	N/A
Remarks NA															
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			49.462	12.320		3.914		7.855		-		7.855	Continuing	Continuing	N/A
Remarks NA															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0604161D8Z / Nuclear and Conventional Physical Security/Countering Nuclear Threats	Project (Number/Name) 163 / Nuclear and Conventional Physical Security



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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Office of the Secretary Of Defense			Date: February 2019
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0604161D8Z / Nuclear and Conventional Physical Security/Countering Nuclear Threats	Project (Number/Name) 163 / Nuclear and Conventional Physical Security	

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Detection & Assessment				
Detection & Assessment	1	2012	4	2024
Decision Support				
Decision Support	1	2012	4	2024
Storage & Safeguards				
Storage & Safeguards	1	2012	4	2024
Installation & Transport Security				
Installation & transport Security	1	2012	4	2024
Prevention				
Prevention	1	2012	4	2024
Access Control				
Access Control	1	2012	4	2024
Analytical Support				
Analytical Support	4	2018	4	2024

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 5					R-1 Program Element (Number/Name) PE 0604161D8Z / Nuclear and Conventional Physical Security/Countering Nuclear Threats				Project (Number/Name) 042 / CNT Prevention SDD			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
042: CNT Prevention SDD	11.718	0.000	4.400	3.421	-	3.421	0.100	0.000	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Please note: FY 2018 funding, within internal financial system, was erroneously combined within project code 163 (\$12.320) versus the proper breakout between project codes 163 (\$7.223) and 042 (\$5.097). The internal system cannot be changed at this time preventing us from reporting the actual cost breakdown.

A. Mission Description and Budget Item Justification

Establish a Defense-wide Nuclear Threat Reduction (NTR) Materiel Development Program focused on transitioning maturing technology development into operational capabilities that address gaps identified by Services, Combatant Commands, and Joint Staff. The CNT acquisition strategy directly applies to Joint requirements for CNT materiel development and addresses the materiel and sustainment gaps for general purpose Joint Forces including the US Army 20th CBNECommand / Navy Visit, Board, Search, and Seizure / Technical Support Groups (NIMBLE ELDER and the US Special Operations Command).

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
Title: CNT Rad/Nuc Passive Defense	0.000	4.400	3.421
Description: Advanced Development of Joint Radiological and Nuclear passive defense systems (i.e. Radiological Detection System and the Joint Personal Dosimeter). The Radiological Detection System will provide a ruggedized Radiation Detection, Indication, and Computation for real time gamma radiation monitoring and low energy x-ray, beta, alpha, and neutron detection. The Joint Personal Dosimeter will provide a joint solution to increase capability and reduce life-cycle costs. Both systems will address Operation TOMODACHI (response to Japan's Fukushima Daiichi nuclear power plant incident) lessons learned for common, interoperable equipment with adequate sensitivity and common units of measure.			
FY 2019 Plans: Continue the development of Joint Radiological and Nuclear passive defense systems (i.e. Radiological Detection System)			
FY 2020 Plans: Complete the development of Joint Radiological and Nuclear passive defense systems (i.e. Radiological Detection System)			
FY 2019 to FY 2020 Increase/Decrease Statement:			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0604161D8Z / <i>Nuclear and Conventional Physical Security/Countering Nuclear Threats</i>	Project (Number/Name) 042 / <i>CNT Prevention SDD</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
No change			
Accomplishments/Planned Programs Subtotals		0.000	4.400
FY 2020			
3.421			
C. Other Program Funding Summary (\$ in Millions) N/A			
Remarks			
D. Acquisition Strategy N/A			
E. Performance Metrics The program performance metrics are established/approved through the Program Manager. The cost, schedule and technical progress is reviewed on a quarterly basis. Performance variances are addressed and corrective action(s) is(are) implemented as necessary.			

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0604161D8Z / <i>Nuclear and Conventional Physical Security/Countering Nuclear Threats</i>	Project (Number/Name) 042 / <i>CNT Prevention SDD</i>
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Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Radiological Detection System	Sub Allot	JPEO CBD : Aberdeen, MD	1.901	0.000		4.400		3.421		-		3.421	Continuing	Continuing	-
Joint Personal Dosimeter	Sub Allot	JPEO CBD : Aberdeen, MD	9.817	-		-		-		-		-	Continuing	Continuing	-
Active Prevention System	TBD	TBD : TBD	-	-		-		-		-		-	Continuing	Continuing	-
Subtotal			11.718	0.000		4.400		3.421		-		3.421	Continuing	Continuing	N/A

Remarks

Please note: FY 2018 funding, within internal financial system, was erroneously combined within project code 163 (\$12.320) versus the proper breakout between project codes 163 (\$7.223) and 042 (\$5.097). The internal system cannot be changed at this time preventing us from reporting the actual cost breakdown.

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	11.718	0.000		4.400		3.421		-		3.421	Continuing	Continuing	N/A

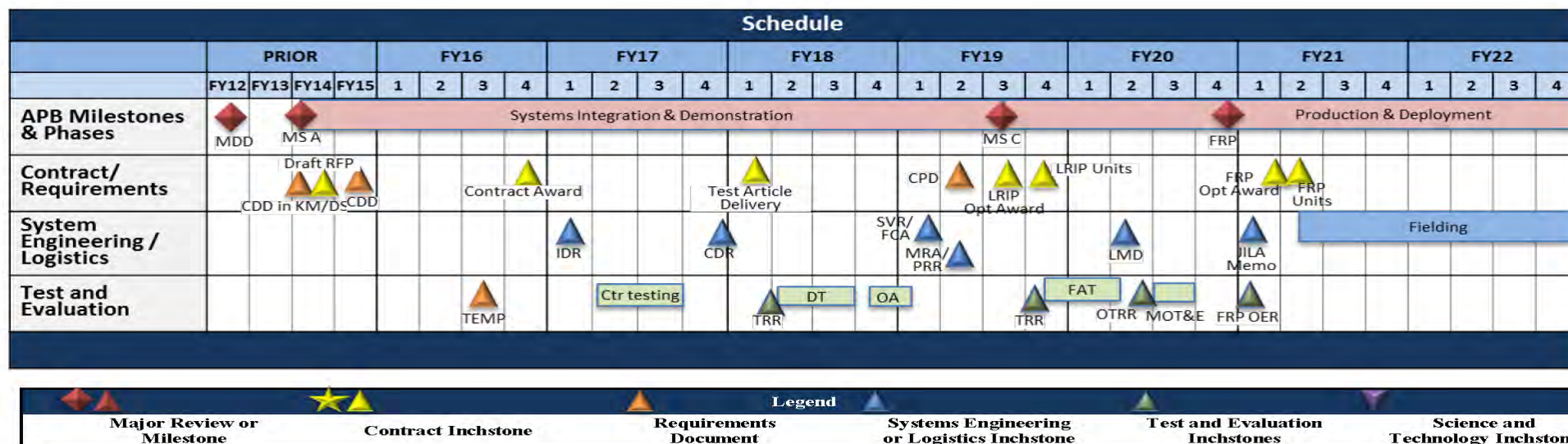
Remarks

Please note: FY 2018 funding, within internal financial system, was erroneously combined within project code 163 (\$12.320) versus the proper breakout between project codes 163 (\$7.223) and 042 (\$5.097). The internal system cannot be changed at this time preventing us from reporting the actual cost breakdown.

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0604161D8Z / Nuclear and Conventional Physical Security/Countering Nuclear Threats	Project (Number/Name) 042 / CNT Prevention SDD

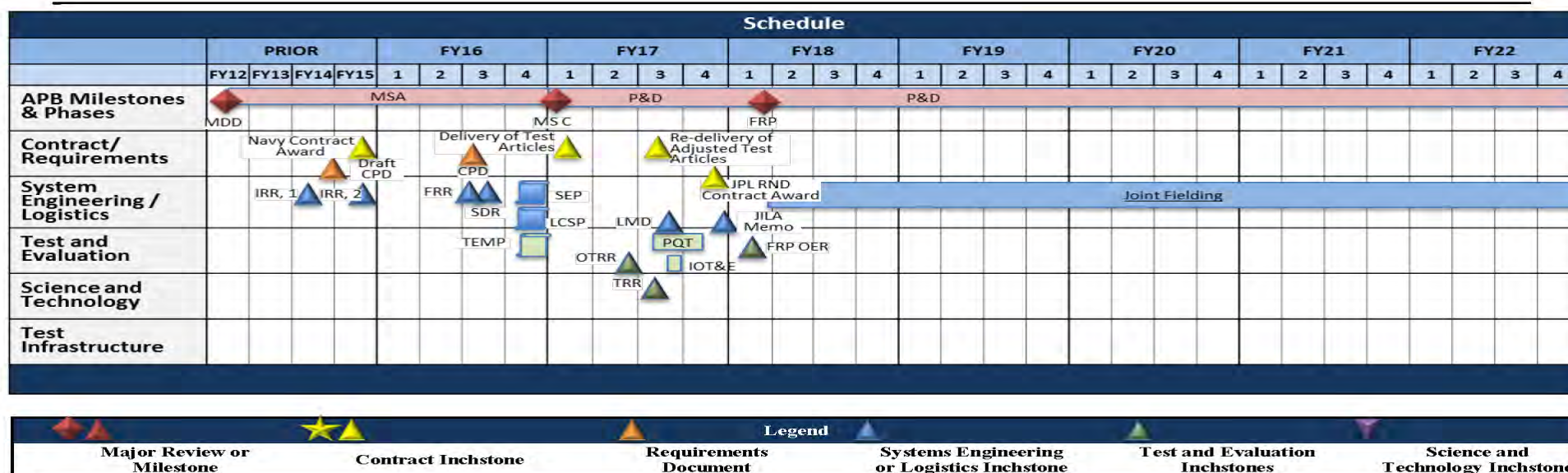
Radiological Detection System



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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense			Date: February 2019
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0604161D8Z / Nuclear and Conventional Physical Security/Countering Nuclear Threats	Project (Number/Name) 042 / CNT Prevention SDD	

Joint Personal Dosimeter



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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Office of the Secretary Of Defense			Date: February 2019
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0604161D8Z / <i>Nuclear and Conventional Physical Security/Countering Nuclear Threats</i>	Project (Number/Name) 042 / <i>CNT Prevention SDD</i>	

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>Radiological Detection System</i>				
Radiological Detection System	1	2018	4	2020
<i>Joint Personal Dosimeter</i>				
Joint Personal Dosimeter	4	2014	1	2018
<i>Active Prevention System</i>				
Active Prevention System	1	2019	4	2024

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity					R-1 Program Element (Number/Name)							
0400: Research, Development, Test & Evaluation, Defense-Wide / BA 5: System Development & Demonstration (SDD)					PE 0604165D8Z / Prompt Global Strike Capability Development							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	1,234.376	360.860	465.852	107.000	-	107.000	0.000	0.000	0.000	0.000	Continuing	Continuing
166: Alternate Re-Entry System/ Warhead Engineering	1,234.376	360.860	465.852	107.000	-	107.000	0.000	0.000	0.000	0.000	Continuing	Continuing

Note

In FY 2020, majority of Conventional Prompt Strike funding transfers to the U.S. Navy (PE 0604659N).

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 the Services, Agencies, national research laboratories, and further involvement of competitive 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. Program timing will be driven by the outcome of flight and ground test events as well as DoD budgets.

The hypersonic Prompt Global Strike Capability Development Program Element supports the National Defense Strategy's focus on technological advancements that enhance deterrence and increase strategic flexibility, freedom of action, and Joint Force lethality.

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	201.749	263.414	0.000	-	0.000
Current President's Budget	360.860	465.852	107.000	-	107.000
Total Adjustments	159.111	202.438	107.000	-	107.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	203.500			
• Congressional Directed Transfers	-	-			
• Reprogrammings	159.500	-			
• SBIR/STTR Transfer	-	-			
• FFRDC Reduction	-0.389	-1.062	-	-	-
• Adjustment reflecting DoD priorities	-	-	107.000	-	107.000

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
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	
Change Summary Explanation FY 2018: \$159.500 million was reprogrammed to support CPS acceleration activities, including efforts to achieve a land-based capability, production transition to industry, industrial capacity improvements, and test & evaluation infrastructure improvements. FY 2019: \$203.500 million Congressional add applied to continue program acceleration activities and support quiet hypersonics research. FY 2020: \$31.000 million applied to complete U.S. industrial capacity improvements to produce components for CPS Common Hypersonic Glide Bodies (C-HGBs); \$76.000 million supports classified munitions program - further information available upon request.		

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
166: Alternate Re-Entry System/ Warhead Engineering	1,234.376	360.860	465.852	107.000	-	107.000	0.000	0.000	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In FY 2020, the majority of Conventional Prompt Strike funding transfers to the U.S. Navy (PE 0604659N).

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 the Services, Agencies, national research laboratories, and further 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. Program timing will be driven by the outcome of flight and ground test events as well as DoD budgets.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
Title: Alternative Re-Entry System/Warhead Engineering and Delivery Vehicle Options/Development	360.860	417.852	31.000
Description: This sub-project will test and evaluate alternative booster and delivery vehicle options and will assess the feasibility of producing an affordable solution to fill the CPGS capability gap. It will mature technologies that could lead to advanced systems with the following characteristics: effects on targets in a very short-period of time from execution order; non-ballistic flight over the majority of the flight path; positive control from launch to impact; adequate cross-range/maneuverability to avoid over flight issues; and controlled stage drop over Broad Ocean Area. The technologies developed will have cross-Service and cross-concept applicability and will be developed through close coordination among DoD components. This activity will support both ground and flight tests and provide all national data to inform a potential acquisition program.			
FY 2019 Plans: <ul style="list-style-type: none"> - Continue the manufacturing and testing of Hypersonic Glide Body and Booster to be used in FE-2 - Begin manufacturing and testing of Hypersonic Glide Body to be used in FE-3 - Continue intermediate range objective technology booster development for FE-3 with competitive industry; to include hardware procurement and fabrication - Support development of future flight test systems for CPGS concepts as required 			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0604165D8Z I Prompt Global Strike Capability Development	Project (Number/Name) 166 I Alternate Re-Entry System/Warhead Engineering		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<div>- Continue studies for future system development to examine cost, lethality, aerodynamic and thermal characteristics, command and control, operational aspects, and technology integrated product teams</div> <div>- Update the Technology Development Strategy and system engineering documentation based on updated CPGS engineering and test data, trade studies, and on-going risk reduction/technology development efforts</div> <div>- Conduct trade studies to evaluate system alternatives, affordability, end-to-end system concepts that will study a weaponized integrated system complete with system architecture, and industrial manufacturing readiness</div> <div>- Continue aerodynamic and weapon risk reduction and technology maturation efforts through ground and wind tunnel tests to improve modeling and simulation capabilities and technology readiness, assessing readiness to conducted integrated penetrator component technology tests</div> <div>- Continue Systems Engineering support to CPGS program and acquisition. Apply support to Integrated Product Teams to facilitate judgments of feasibility and risks of all CPGS concepts. Continue to support outreach and strategic messaging to entire CPGS community and COCOMs</div> <div>- Continue to support test range infrastructure for long term use</div> <div>- Continue studies for future system development to examine cost, lethality, aerodynamic and thermal characteristics, command and control, operational aspects, and technology integrated product teams</div> <div>FY 2020 Plans:</div> <div>Complete U.S. industrial capacity improvements to produce components for CPS Common Hypersonic Glide Bodies (C-HGBs). Using FY 2019 funding Conventional Prompt Strike will:</div> <div>- Continue U.S. industrial capacity improvements to produce components for CPS C-HGBs</div> <div>- Continue to support C-HGB manufacturing, demonstration, test, and production efforts</div> <div>- Support development of future flight test systems for CPGS concepts as required</div> <div>- Continue studies for future system development to examine cost, lethality, aerodynamic and thermal characteristics, command and control, operational aspects, and technology integrated product teams</div> <div>- Update Technology Development Strategy and system engineering documentation based on updated CPGS engineering and test data, trade studies, and on-going risk reduction/technology development efforts</div> <div>- Continue Systems Engineering support to CPGS program and acquisition</div> <div>FY 2019 to FY 2020 Increase/Decrease Statement:</div> <div>FY 2020 Conventional Prompt Strike will decrease and majority of Conventional Prompt Strike Program funding will transfer to the U.S. Navy.</div>				
Title: Munitions Program		0.000	48.000	76.000
Description: This is a classified munitions programs. Additional information available upon request.				

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0604165D8Z / <i>Prompt Global Strike Capability Development</i>	Project (Number/Name) 166 / <i>Alternate Re-Entry System/Warhead Engineering</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
FY 2019 Plans: Details are classified.			
FY 2020 Plans: Complete classified munitions program. Additional information available upon request.			
FY 2019 to FY 2020 Increase/Decrease Statement: Funding profile increases in FY 2020. Details available at higher classification.			
Accomplishments/Planned Programs Subtotals		360.860	465.852
C. Other Program Funding Summary (\$ in Millions) N/A			
Remarks			
D. Acquisition Strategy N/A			
E. Performance Metrics N/A			

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense												Date: February 2019			
Appropriation/Budget Activity 0400 / 5						R-1 Program Element (Number/Name) PE 0604165D8Z / <i>Prompt Global Strike Capability Development</i>				Project (Number/Name) 166 / <i>Alternate Re-Entry System/Warhead Engineering</i>					

Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Alternative Reentry System/Warhead Engineering and Delivery Vehicle Options/Development	Allot	Army Space and Missile Defense Center/Navy Strategic Systems Program : Huntsville AL/Washington DC	1,234.376	360.860		465.852		107.000		-		107.000		Continuing	Continuing	-
Subtotal			1,234.376	360.860		465.852		107.000		-		107.000		Continuing	Continuing	N/A

Remarks NA																
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	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	1,234.376	360.860		465.852		107.000		-		107.000	Continuing	Continuing	N/A

Remarks NA																
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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense			Date: February 2019
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0604165D8Z / <i>Prompt Global Strike Capability Development</i>	Project (Number/Name) 166 / <i>Alternate Re-Entry System/Warhead Engineering</i>	

P166 CPGS Flight Experiment 1 (order 10)

	FY 2016				FY 2017				FY 2018				FY 2019				FY 2020				FY 2021			
	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/Design																								
Fabrication/Integration																								
Test Execution																								
Post Test Analysis & Reporting																								

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense			Date: February 2019
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0604165D8Z / <i>Prompt Global Strike Capability Development</i>	Project (Number/Name) 166 / <i>Alternate Re-Entry System/Warhead Engineering</i>	

P166 CPGS Flight Experiment 2 (order 20)

	FY 2016				FY 2017				FY 2018				FY 2019				FY 2020				FY 2021			
	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/Design																								
Fabrication/Integr.																								
Test Execution																								
Post Test Analysis & Reporting																								

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense			Date: February 2019
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0604165D8Z / <i>Prompt Global Strike Capability Development</i>	Project (Number/Name) 166 / <i>Alternate Re-Entry System/Warhead Engineering</i>	

P166 Alternate Re-Entry System/Warhead Engineering

Trade Studies, Ground Testing and Systems Engineering	FY 2016				FY 2017				FY 2018				FY 2019				FY 2020				FY 2021			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Office of the Secretary Of Defense			Date: February 2019
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0604165D8Z / <i>Prompt Global Strike Capability Development</i>	Project (Number/Name) 166 / <i>Alternate Re-Entry System/Warhead Engineering</i>	

Schedule Details

Events	Start		End	
	Quarter	Year	Quarter	Year
Navy Flight Experiment 1	1	2017	4	2017
Navy Flight Experiment 2	4	2017	4	2020

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 5: System Development & Demonstration (SDD)</i>					R-1 Program Element (Number/Name) PE 0604771D8Z <i>I Joint Tactical Information Distribution System (JTIDS)</i>							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	101.070	24.268	34.425	40.102	-	40.102	26.718	15.819	16.027	16.283	Continuing	Continuing
771: <i>Link-16 Tactical Data Link (TDL) Transformation</i>	92.650	19.268	20.207	12.563	-	12.563	11.976	12.789	13.037	13.230	Continuing	Continuing
105: <i>Cyber Capability & Platform Resilience</i>	8.420	5.000	14.218	12.539	-	12.539	4.742	3.030	2.990	3.053	Continuing	Continuing
028: <i>DIB Secure Cloud Managed Services Pilot</i>	0.000	0.000	0.000	15.000	-	15.000	10.000	0.000	0.000	0.000	Continuing	Continuing

Note

19.503

A. Mission Description and Budget Item Justification

Mission Description and Budget Item Justification: The Joint Tactical Information Distribution Systems (JTIDS) program supports collaborative efforts to achieve strategy-driven capability development spanning the suite of Department enablers and programs to include Communications and Networks, Cyber, Command and Control (C2), space, Nuclear Command, Control, and Communications (NC3), and technology within the Assistant Secretary of Defense Acquisition Portfolio. JTIDS also supports matters relating to acquisition and the integration and protection of technology that enable capability for the warfighter, including cross-cutting functional capabilities that advance the acquisition enterprise, drive innovative acquisition approaches, policy, acquisition management, advanced software acquisition, and business/financial management. These efforts include conducting mission informed capability-based analysis; portfolio assessments to include analyzing modernization trends that result in the development of roadmaps or business area strategies that support balanced investment decisions; and monitoring and assessing Major Defense Acquisition Programs(MDAPs) , Major Automated Information Systems (MAIS), and defense Business Systems in a capability portfolio context. Activities in the JTIDS include (1) mission informed capability-based analysis; (2) Interoperability & Integration; (3) roadmap development and support to business area strategies; and (4) support tools and guidance; (5) Innovative Acquisition Approaches, (6) Software acquisition, and (7) advanced acquisition software and software provenance. JTIDS also enables cross-department collaboration to enable enterprise-wide approaches. JTIDS also enables cross-department collaboration to enable enterprise-wide approaches. This includes: (1) vertical and horizontal integration activities within the Department and with the interagency where appropriate; (2) engaging in a coordinated portfolio-based approach to planning, programming, budgeting and execution; and (3) reform efforts at the legislative, governance, policy, management and execution levels. JTIDS is focused on capabilities-based portfolio management of the Department's key enablers, thus there are many shared equities with in ASD(A) and across OSD. To fully meet mission need the JTIDS program supports extensive collaboration with required alliances and with other OSD PSA's.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: Research, Development, Test & Evaluation, Defense-Wide I BA 5: System Development & Demonstration (SDD)	R-1 Program Element (Number/Name) PE 0604771D8Z I Joint Tactical Information Distribution System (JTIDS)
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B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	15.358	19.503	21.803	-	21.803
Current President's Budget	24.268	34.425	40.102	-	40.102
Total Adjustments	8.910	14.922	18.299	-	18.299
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	9.500	5.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.560	-			
• FFRDC	-0.030	-0.078	-	-	-
• Congressional Add - Managed Secure Cloud Pilot for DIB	-	-	15.000	-	15.000
• Congressional Add - NC3 Governance	-	-	4.000	-	4.000
• Biological and Chemical Threats Preparedness	-	-	-0.701	-	-0.701
• Increase for Cyber	-	10.000	-	-	-

Change Summary Explanation

FY20 and 21 increase for Managed secured cloud for DIB and for NC3 Governance. Decrease for INV-D-032 CBDP - Biological and Chemical Threats Preparedness.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
771: Link-16 Tactical Data Link (TDL) Transformation	92.650	19.268	20.207	12.563	-	12.563	11.976	12.789	13.037	13.230	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Mission Description and Budget Item Justification: The Joint Tactical Information Distribution Systems (JTIDS) program supports collaborative efforts to achieve strategy-driven capability development spanning the suite of Department enablers and programs to include Communications and Networks, Cyber, Command and Control (C2), space, Nuclear Command, Control, and Communications (NC3), and technology within the Assistant Secretary of Defense Acquisition Portfolio. JTIDS also supports matters relating to acquisition and the integration and protection of technology that enable capability for the warfighter, including cross-cutting functional capabilities that advance the acquisition enterprise, drive innovative acquisition approaches, policy, acquisition management, advanced software acquisition, and business/financial management. These efforts include conducting mission informed capability-based analysis; portfolio assessments to include analyzing modernization trends that result in the development of roadmaps or business area strategies that support balanced investment decisions; and monitoring and assessing Major Defense Acquisition Programs(MDAPs) , Major Automated Information Systems (MAIS), and defense Business Systems in a capability portfolio context. Activities in the JTIDS include (1) mission informed capability-based analysis; (2) Interoperability & Integration; (3) roadmap development and support to business area strategies; and (4) support tools and guidance; (5) Innovative Acquisition Approaches, (6) Software acquisition, and (7) advanced acquisition software and software provenance. JTIDS also enables cross-department collaboration to enable enterprise-wide approaches. JTIDS also enables cross-department collaboration to enable enterprise-wide approaches. This includes: (1) vertical and horizontal integration activities within the Department and with the interagency where appropriate; (2) engaging in a coordinated portfolio-based approach to planning, programming, budgeting and execution; and (3) reform efforts at the legislative, governance, policy, management and execution levels. JTIDS is focused on capabilities-based portfolio management of the Department's key enablers, thus there are many shared equities with in ASD(A) and across OSD. To fully meet mission need the JTIDS program supports extensive collaboration with required alliances and with other OSD PSA's.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
Title: Common Joint Tactical Information Initiatives	19.268	20.207	12.563
Description: Mission Description and Budget Item Justification: The Joint Tactical Information Distribution Systems (JTIDS) program supports collaborative efforts to achieve strategy-driven capability development spanning the suite of Department enablers and programs to include Communications and Networks, Cyber, Command and Control (C2), space, Nuclear Command, Control, and Communications (NC3), and technology within the Assistant Secretary of Defense Acquisition Portfolio. JTIDS also supports matters relating to acquisition and the integration and protection of technology that enable capability for the warfighter, including cross-cutting functional capabilities that advance the acquisition enterprise, drive innovative acquisition approaches, policy, acquisition management, advanced software acquisition, and business/financial management. These efforts include conducting mission informed capability-based analysis; portfolio assessments to include analyzing modernization trends that result in the development of roadmaps or business area strategies that support balanced investment decisions; and monitoring			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense			Date: February 2019		
Appropriation/Budget Activity 0400 / 5		R-1 Program Element (Number/Name) PE 0604771D8Z / <i>Joint Tactical Information Distribution System (JTIDS)</i>		Project (Number/Name) 771 / <i>Link-16 Tactical Data Link (TDL) Transformation</i>	
B. Accomplishments/Planned Programs (\$ in Millions)			FY 2018	FY 2019	FY 2020
<p>and assessing Major Defense Acquisition Programs(MDAPs) , Major Automated Information Systems (MAIS), and defense Business Systems in a capability portfolio context. Activities in the JTIDS include (1) mission informed capability-based analysis; (2) Interoperability & Integration; (3) roadmap development and support to business area strategies; and (4) support tools and guidance; (5) Innovative Acquisition Approaches, (6) Software acquisition, and (7) advanced acquisition software and software provenance. JTIDS also enables cross-department collaboration to enable enterprise-wide approaches. JTIDS also enables cross-department collaboration to enable enterprise-wide approaches. This includes: (1) vertical and horizontal integration activities within the Department and with the interagency where appropriate; (2) engaging in a coordinated portfolio-based approach to planning, programming, budgeting and execution; and (3) reform efforts at the legislative, governance, policy, management and execution levels. JTIDS is focused on capabilities-based portfolio management of the Department's key enablers, thus there are many shared equities with in ASD(A) and across OSD. To fully meet mission need the JTIDS program supports extensive collaboration with required alliances and with other OSD PSA's.</p> <p>FY 2019 Plans:</p> <ul style="list-style-type: none"> - Common Data Link (CDL) Principal Staff Assistant: Continue to coordinate with CDL Executive Agent (EA) to develop and maintain a technology roadmap and terminal database to improve interoperability, configuration management, and focused technology investments. Continue implementation and oversight of an enterprise transition strategy to modernize DoD ISR waveforms to converge on a DoD standard for tactical ISR communications. Update CDL technology development roadmap to reflect current trends in technology that can add enhanced capabilities to CDL systems. Continue planning and conduct of CDL SRP and IPT meetings to develop and refine the CDL investment portfolio and to identify strategic ISR communications issues the DoD will face in the future. Conduct analysis of Airborne ISR communications transport infrastructure in coordination with Joint Staff, Services and Combatant Commands in order to identify a way ahead for establishing an effective/efficient global enterprise capability. Conduct annual CDL enterprise modernization analysis and review Service PPBE submissions to assess enterprise migration to Bandwidth Efficient CDL by 2023. Continue to promote open system development solutions that expand the vendor base and allow increased competition and innovation. Expand the CDL Reference Implementation Laboratory concept of a government owned technical baseline while assessing a Common Development Environment that encourages rapid develop, testing, and fielding of new capabilities. - Acquisition Management and Oversight: Provide technical assistance in developing IT related acquisition policy, including updates to DoD Series 5000 necessitated by changes in statue, regulation and management direction. Provide technical assessments and programmatic recommendations across DASD functional areas to address interoperability gaps and work early in the systems engineering. - FAB-T: Support IOT&E execution. Work to assure the program has a successful LRIP-2 decision. Continue to support PNVC integration and test. Provide risk assessments of system integration into the various airborne, ground fixed and ground transportable systems prior to installation. Support implementation of additional reliability testing to provide increased data for program acquisition and operational decisions. 					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense			Date: February 2019		
Appropriation/Budget Activity 0400 / 5		R-1 Program Element (Number/Name) PE 0604771D8Z / <i>Joint Tactical Information Distribution System (JTIDS)</i>		Project (Number/Name) 771 / <i>Link-16 Tactical Data Link (TDL) Transformation</i>	
B. Accomplishments/Planned Programs (\$ in Millions)			FY 2018	FY 2019	FY 2020
<ul style="list-style-type: none"> - Wideband SATCOM AoA: Complete AoA assessing material solutions for WGS replenishment and for supporting other traditional commercial supplied users considering life-cycle cost, performance, suitability, operational effectiveness, and resiliency. Provide final report to D, CAPE for sufficiency review and work with GAO on Congressionally directed review. - Evolved AEHF / AEHF: Provide programmatic analysis, technical reviews, and assessments of the Evolved AEHF and AEHF programs to reduce development, integration, and procurement risks. Provide risk assessments as the program continues to launch spacecraft and improve the Mission Planning Element. Work to support efforts for the Evolved AEHF and assess implementation of XDR and PTW waveforms on new satellite payload and bus. - Mid-Term Polar SATCOM (MPS) / EPS: Provide programmatic analysis, technical reviews, and assessments of the MPS and EPS programs to reduce development, integration, and procurement risks. Assess risk as the TT&C system is integrated and tested prior to operations. Work to support and assess efforts for the follow-on MPS system, whether as a hosted payload or a free flyer. - MUOS capable terminals: Support FOT&E execution. Provide analysis, technical assessments and fielding reviews for implementing the MUOS capability. Work to support the certification of ground, maritime and airborne terminals, and testing required to enable operational authorizations. - Joint Tactical Networking Center (JTNC): Provide technical and programmatic analysis to support the Defense Acquisition Executive's role as the co-chair of the JTNC Board of Directors (BoD). Provide Secretariat functions for the JTNC BoD. - All former JTRS(HMS, MNVR, AMF, JTN)Programs – Upon request, provide technical expertise and recommendations to facilitate program compliance with IT related acquisition policy, in accordance with DoD Series 5000 and applicable Milestone Decision Authority direction. Provide programmatic recommendations regarding cost/schedule/performance tradeoffs and application of evolving acquisition policies, based on lessons observed in oversight of acquisition programs across the Department. - Ground Tactical Networks Advanced Capabilities: Mature narrowband dismounted communications capability with radio hardware prototype, robust modeling and simulation, and reusable waveform software code. Form industry engagement to promote transition into non-developmental item radios. - Integrated Electromagnetic Spectrum Operations (EMSO): Track implementation of iEMSO strategy in radio and EW device development plans. Assess and down-select technical interoperability and architectural approaches. Ensure adequate funding and testing to assess maturity of solutions. Develop science and technology roadmap to synchronize transition of key technologies to programs of record for spectrum-dependent systems. FY17 work will focus will focus on selected sensor and electronic warfare systems and continue work on communications systems. - Electronic Warfare: Maintain situational awareness of and contribute to evolving DoD and Service electronic warfare strategy, and in conjunction with Electromagnetic Spectrum Operations efforts, assist in coordinating development of new and integrated enterprise capabilities. - Tactical Data Link Modernization: Provide OSD oversight and cross-Service coordination of Tactical Data Link (TDL) modernization issues funded during FY16-FY17 Program Reviews. Identify areas where additional risk reduction activities are 					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0604771D8Z / <i>Joint Tactical Information Distribution System (JTIDS)</i>	Project (Number/Name) 771 / <i>Link-16 Tactical Data Link (TDL) Transformation</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>necessary in order to meet CAPE and DMAG guidance/schedule. Track and assess testing of Link 16 capability improvements in Multi-function Information Distribution System (MIDS-J) terminals (4th Gen aircraft), Communications, Navigation & Identification (CNI) terminal in F-35, emerging 6th Gen aircraft concepts, and Weapons Data Link (WDL) radios. Assess transferability of these improvements to other omni-directional TDLs, such as TTNT. Begin establishing an improved enterprise governance model for Tactical Data Links. Continue to perform oversight and joint acquisition integration of Service implementation of congressionally directed (FY17 NDAA) focus on a modular open system approach (MOSA), to the maximum extent practicable for TDLs, in synchronization with CDL, and other appropriate capabilities. Identify MADL evolution technology development needs for further funding to enable transition to F-35 and other platforms, and begin establishment of a Government Controlled Technical Baseline for MADL. Assess modeling and simulation infrastructure and currency with adversary threat emitters to improve investment decisions on TDL improvements.</p> <p>- Space Ops: Conduct SATOPS Modernization technical assessments; provide technical Oversight/AFSCN Modernization Implementation; conduct AFSCN Event Driven Net Centric Review/Technical Assessment.</p> <p>- PNT Programs Technical Assessments: Continue OIPT leadership role. Develop and implement Annual GPS Enterprise Review to verify readiness of GPS III, MGUE, and OCX programs to progress to next phase of the acquisition process. Ensure synchronization of the three programs to meet the direction of the DAE. Conduct deep dive technical analyses to understand all phases of the GPS enterprise programs and predecessor programs that are part of the GPS Enterprise. Review PNT programs for data strategies, systems engineering, risks and mitigations in support of milestone decisions. Initiate and conduct studies to expedite fielding and support of M Code capability for forces in the field. Conduct Nunn-McCurdy Reviews of program that have critically breached APB cost parameters and prepare for DAE Certification. Report results to congress after DAE Certification and ensure regular reporting is conducted IEW public law. Conduct reviews of innovative acquisition efforts intended to reduce overall satellite cost through payload and spacecraft competition. Conduct Quarterly OCX Reviews at USD/SECAF/CEO level to ensure OCX maintains progress towards fielding user required capabilities. Develop and implement contingency plans to ensure constellation command and control management and enable early M-Code availability.</p> <p>- PNT Portfolio Management: Continue implementation of GPSEM/PNT Assurance Investment Strategy and Roadmap, ensuring AoA recommendations are addressed. Continue to support major program milestones and internal OSD reviews such as Strategic Portfolio Reviews, DMAGs, etc.</p> <p>- National Leadership Command Capability (NLCC): Continue in lead role as primary action office for A&S in her role as Nuclear Command, Control, and Communications (NC3) Enterprise Capability Portfolio Manager and co-chair of the Council on Oversight of the National Leadership Command, Control, and Communications System (CONLC3S). Work directly with United States Strategic Command Nuclear Enterprise Center and the CONCL3S Executive Secretariat (DOD CIO) to oversee all aspects of NC3 and National Leadership Command Capability (NLCC) governance and subordinate working groups that prepare/tee up decisions and execute assigned actions. Continue as primary action office for NC3 enterprise capability portfolio management. Continue as primary A&S action office to respond to congressionally-directed actions. Continue as primary A&S representative to NC3 and NLCC-related studies, analyses, and policy updates. Also lead review process for any NC3 and NLCC related documents.</p>			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0604771D8Z / <i>Joint Tactical Information Distribution System (JTIDS)</i>	Project (Number/Name) 771 / <i>Link-16 Tactical Data Link (TDL) Transformation</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>- NC3 Capability Portfolio Manager (CPM): Work collaboratively and support Commander US Strategic Command (CDRUSSTRATCOM) in his role as the NC3 Enterprise Lead. In this capacity, manage NC3 modernization and sustainment activities across approximately 220 programs, systems, and projects as a portfolio of capabilities rather than a series of episodic and unsynchronized programs. With increased acquisition and resource responsibilities the NC3 CPM will lead the NC3 Enterprise process, develop and advocate for NC3 within the Program Budget and Review process, and provide CDRUSSTRATCOM resource and acquisition information to inform operational risk assessment.</p> <p>- Joint C2 Portfolio Management: Collaborate with CIO as PSA for C2, and Joint Staff J6 as the User Capabilities POC to invigorate the JC2 Governance Framework. Increase relevancy and enhance the relationship with the PM-CESG Program Managers and other members and the OSD and Joint Staff.</p> <p>- C2 Data: Provide technical expertise for ensuring C2 data are visible, accessible, understandable, trustable and interoperable. Provide technical assessment and assistance for implementation of National Information Exchange Model (NIEM)-based information exchanges across the DoD. Update the C2 Authoritative Data Source roadmap and update C2 data architecture.</p> <p>- Joint C2 Architecture: Provided technical expertise for the update the Joint C2 Architecture to guide Joint C2 capability area development activities across the Services, Agencies and Combatant Commands.</p> <p>- Continue Analysis of Alternatives on the Coalition Information Sharing Environment. This AT&L-led independent 18-month study will analyze and recommend a preferred alternative to determine the most effective and efficient means for the Department of Defense to provide a coalition network and services in support of Mission Partner operations.</p> <p>- Software Provenance and Supply Chain Risk Management: Continue to provide technical analysis and support to Software Provenance and Supply Chain Risk Management policy development, including implementation plans for changes in statute, regulation and management direction. Provide technical assessments and course of action recommendations to address cybersecurity engineering and risk management considerations in the procurement process. Upon request, provide technical expertise and industry assessments to facilitate development of standard procedures to institutionalize SCRM in the procurement process. Focus areas may include development implementation plans, policy development and piloting initiatives, technical assessments of threat information sharing tools, evaluation of independent continuous monitoring capabilities, and recommendations for legislative change proposals to improve DoD's execution of SCRM</p> <p>- Advanced Software - Pilot Program: Continue to provide Technical/Engineering support to Agile Acquisition Pilots and Policy development, Support as Administrator and Curator for the online Agile Community of Practice, Provide SME contributions & Technical/Engineering support to individual Agile Acquisition Pilots as Pilot Advisor, Assist pilot programs with development of their required program documentation, Provide agile coaching and training. Provide Technical/Engineering support to Software Provenance and Supply Chain Risk Management Planning: Develop Campaign Plan and implementation plan for "Deliver Uncompromised" initiatives, Draft "101" type informational briefing materials, courseware inputs, ID and assess info sharing tools, development of draft policy/procedures documents. Deliver a 180 day status report & draft final Congressional Pilot reports, Provide Technical/ Engineering Support to Agile Acquisition Pilots.</p>			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense			Date: February 2019		
Appropriation/Budget Activity 0400 / 5		R-1 Program Element (Number/Name) PE 0604771D8Z / <i>Joint Tactical Information Distribution System (JTIDS)</i>		Project (Number/Name) 771 / <i>Link-16 Tactical Data Link (TDL) Transformation</i>	
B. Accomplishments/Planned Programs (\$ in Millions)			FY 2018	FY 2019	FY 2020
<p>- Advanced Software - Defense Science Board Recommendations Implementation: Continue to develop practical approaches to encourage adoption of game-changing software development and sustainment approaches that will deliver capabilities that catalyze greater mission impact to the warfighter and Enterprise more rapidly while better controlling cost and improving resilience in the current and emerging cyber threat environment. Develop a final Implementation Strategic Roadmap that identifies short, medium, and long-term goals for each of the DSB recommendations. It will identify likely risk areas, develop risk reduction approaches, and propose appropriate metrics for new programs that will better reflect the health of software programs undergoing modernization or in development.</p> <p>- Innovative Acquisition Approaches: Continue to develop or enhance innovative acquisition approaches across hardware, software, IT infrastructure and services acquisition policy and processes to better align with best practices and modern technology approaches. Facilitate widespread adoption of rapid acquisition paths through translating lessons learned/best practices into policy, guidance, and training products and tools, working in partnership with the Acquisition Accelerator sponsored by Strategy Data & Design.</p> <p>- Set-up expanded Air Defense Offensive Counter Air (ADOCA) F-35 support to advise OUSD (A&S) and OASD (A) senior leaders on strategies to produce, develop, and sustain the F-35 Lightning II program and worldwide fleet of aircraft. Provides expert acquisition/program support to enable PPBE planning for the F-35 POM and overall program requirements development. Collaborates with OSD, JCS, F-35 JPO, HAF, & OPNAV as needed. Provides additional portfolio support to ADOCA as required.</p> <p>- Establish the following Mission Engineering capabilities: Develop and manage effects kill chains and enabling architectures. Work with engineers and architects to translate operational needs to capabilities and system networks. Implement kill chains in modeling and simulation environments and execute effects/kill chain performance assessments. Compiles and lends meaning to large amounts of program capability data. Uses expertise in sorting through existing analysis, reviews, studies, industry data, requirements documents, operational scenarios, etc. to uncover data relevant to a thorough evaluation of the effectiveness of a defined mission area.</p> <p>- Launch Maneuver Warfare support which will exploit firepower and attrition on key elements of opposing forces. The Maneuver Element Analyst advocates strategic movement that can bring about the defeat of an opposing force more efficiently than by simply contacting and destroying enemy forces until they can no longer fight. Instead, in maneuver warfare, the destruction of enemy targets is combined with isolation of enemy forces and the exploitation by movement of enemy weaknesses.</p> <p>FY 2020 Plans: IIPM:</p> <p>- Common Data Link (CDL) Principal Staff Assistant: Continue to coordinate with CDL Executive Agent (EA) to develop and maintain a technology roadmap and terminal database to improve interoperability, configuration management, and focused</p>					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0604771D8Z / <i>Joint Tactical Information Distribution System (JTIDS)</i>	Project (Number/Name) 771 / <i>Link-16 Tactical Data Link (TDL) Transformation</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>technology investments. Continue implementation and oversight of an enterprise transition strategy to modernize DoD ISR waveforms to converge on a DoD standard for tactical ISR communications. Update CDL technology development roadmap to reflect current trends in technology that can add enhanced capabilities to CDL systems. Continue planning and conduct of CDL SRP and IPT meetings to develop and refine the CDL investment portfolio and to identify strategic ISR communications issues the DoD will face in the future. Conduct analysis of Airborne ISR communications transport infrastructure in coordination with Joint Staff, Services and Combatant Commands in order to identify a way ahead for establishing an effective/efficient global enterprise capability. Conduct annual CDL enterprise modernization analysis and review Service PPBE submissions to assess enterprise migration to Bandwidth Efficient CDL by 2023. Continue to promote open system development solutions that expand the vendor base and allow increased competition and innovation. Expand the CDL Reference Implementation Laboratory concept of a government owned technical baseline while assessing a Common Development Environment that encourages rapid develop, testing, and fielding of new capabilities.</p> <p>Mid-Term Polar SATCOM (MPS) / EPS: Provide programmatic analysis, technical reviews, and assessments of the MPS and EPS programs to reduce development, integration, and procurement risks. Assess risk as the TT&C system is integrated and tested prior to operations. Work to support and assess efforts for the follow-on MPS system, whether as a hosted payload or a free flyer.</p> <p>- MUOS capable terminals: Support FOT&E execution. Provide analysis, technical assessments and fielding reviews for implementing the MUOS capability. Work to support the certification of ground, maritime and airborne terminals, and testing required to enable operational authorizations.</p> <p>- Joint Tactical Networking Center (JTNC): Provide technical and programmatic analysis to support the Defense Acquisition Executive's role as the co-chair of the JTNC Board of Directors (BoD). Provide Secretariat functions for the JTNC BoD.</p> <p>- All former JTRS(HMS, MNVR, AMF, JTN)Programs – Upon request, provide technical expertise and recommendations to facilitate program compliance with IT related acquisition policy, in accordance with DoD Series 5000 and applicable Milestone Decision Authority direction. Provide programmatic recommendations regarding cost/schedule/performance tradeoffs and application of evolving acquisition policies, based on lessons observed in oversight of acquisition programs across the Department.</p> <p>- Ground Tactical Networks Advanced Capabilities: Mature narrowband dismounted communications capability with radio hardware prototype, robust modeling and simulation, and reusable waveform software code. Form industry engagement to promote transition into non-developmental item radios.</p> <p>- Integrated Electromagnetic Spectrum Operations (EMSO): Track implementation of iEMSO strategy in radio and EW device development plans. Assess and down-select technical interoperability and architectural approaches. Ensure adequate funding and testing to assess maturity of solutions. Develop science and technology roadmap to synchronize transition of key technologies to programs of record for spectrum-dependent systems. FY17 work will focus will focus on selected sensor and electronic warfare systems and continue work on communications systems.</p>			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0604771D8Z / <i>Joint Tactical Information Distribution System (JTIDS)</i>	Project (Number/Name) 771 / <i>Link-16 Tactical Data Link (TDL) Transformation</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>- Electronic Warfare: Maintain situational awareness of and contribute to evolving DoD and Service electronic warfare strategy, and in conjunction with Electromagnetic Spectrum Operations efforts, assist in coordinating development of new and integrated enterprise capabilities.</p> <p>- Tactical Data Link Modernization: Provide OSD oversight and cross-Service coordination of Tactical Data Link (TDL) modernization issues funded during FY16-FY19 Program Reviews. Identify areas where additional risk reduction activities are necessary in order to meet CAPE and DMAG guidance/schedule. Track and assess testing of Link 16 capability improvements in Multi-function Information Distribution System (MIDS-J) terminals (4th Gen aircraft), Communications, Navigation & Identification (CNI) terminal in F-35, emerging 6th Gen aircraft concepts, and Weapons Data Link (WDL) radios. Assess transferability of these improvements to other omni-directional TDLs, such as TTNT. Begin establishing an improved enterprise governance model for Tactical Data Links. Continue to perform oversight and joint acquisition integration of Service implementation of congressionally directed (FY17 NDAA) focus on a modular open system approach (MOSA), to the maximum extent practicable for TDLs, in synchronization with CDL, and other appropriate capabilities. Identify MADL evolution technology development needs for further funding to enable transition to F-35 and other platforms, and begin establishment of a Government Controlled Technical Baseline for MADL. Assess modeling and simulation infrastructure and currency with adversary threat emitters to improve investment decisions on TDL improvements.</p> <p>- National Leadership Command Capability (NLCC): Continue in lead role as primary action office for A&S in her role as Nuclear Command, Control, and Communications (NC3) Enterprise Capability Portfolio Manager and co-chair of the Council on Oversight of the National Leadership Command, Control, and Communications System (CONLC3S). Work directly with United States Strategic Command Nuclear Enterprise Center and the CONCL3S Executive Secretariat (DOD CIO) to oversee all aspects of NC3 and National Leadership Command Capability (NLCC) governance and subordinate working groups that prepare/tee up decisions and execute assigned actions. Continue as primary action office for NC3 enterprise capability portfolio management. Continue as primary A&S action office to respond to congressionally-directed actions. Continue as primary A&S representative to NC3 and NLCC-related studies, analyses, and policy updates. Also lead review process for any NC3 and NLCC related documents.</p> <p>- Joint C2 Portfolio Management: Collaborate with CIO as PSA for C2, and Joint Staff J6 as the User Capabilities POC to invigorate the JC2 Governance Framework. Increase relevancy and enhance the relationship with the PM-CESG Program Managers and other members and the OSD and Joint Staff.</p> <p>- C2 Data: Provide technical expertise for ensuring C2 data are visible, accessible, understandable, trustable and interoperable. Provide technical assessment and assistance for implementation of National Information Exchange Model (NIEM)-based information exchanges across the DoD. Update the C2 Authoritative Data Source roadmap and update C2 data architecture.</p> <p>- Joint C2 Architecture: Provided technical expertise for the update the Joint C2 Architecture to guide Joint C2 capability area development activities across the Services, Agencies and Combatant Commands.</p>			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0604771D8Z / <i>Joint Tactical Information Distribution System (JTIDS)</i>	Project (Number/Name) 771 / <i>Link-16 Tactical Data Link (TDL) Transformation</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<ul style="list-style-type: none"> - Continue Analysis of Alternatives on the Coalition Information Sharing Environment. This AT&L-led independent 18-month study will analyze and recommend a preferred alternative to determine the most effective and efficient means for the Department of Defense to provide a coalition network and services in support of Mission Partner operations. - Propose to Congress changes to existing statutory authorities that will provide USD(A&S) with the authorities necessary to effectively manage the NC3 Enterprise. - Update policies on Nuclear Command, Control, and Communications Systems. - Conduct independent technical risk assessments of five MDAP NC3 programs per CDRUSSTRATCOM established priorities. - Conduct independent technical risk assessment of ten non-MDAP NC3 programs per CDRUSSTRATCOM established priorities. - Review and assess DoD Component plans, programs, and budgets for budget justification and execution and provide advice and assistance to senior DoD Officials at semi-annual NC3 Enterprise Reviews <p>AE:</p> <ul style="list-style-type: none"> - Software Provenance and Supply Chain Risk Management: Continue to provide technical analysis and support to Software Provenance and Supply Chain Risk Management policy development, including implementation plans for changes in statute, regulation and management direction. Provide technical assessments and course of action recommendations to address cybersecurity engineering and risk management considerations in the procurement process. Upon request, provide technical expertise and industry assessments to facilitate development of standard procedures to institutionalize SCRM in the procurement process. Focus areas may include development implementation plans, policy development and piloting initiatives, technical assessments of threat information sharing tools, evaluation of independent continuous monitoring capabilities, and recommendations for legislative change proposals to improve DoD's execution of SCRM. - Advanced Software Pilot Program: Continue to provide Technical/Engineering support to Agile Acquisition Pilots and Policy development, Support as Administrator and Curator for the online Agile Community of Practice, Provide SME contributions & Technical/Engineering support to individual Agile Acquisition Pilots as Pilot Advisor, Assist pilot programs with development of their required program documentation, Provide agile coaching and training. Provide Technical/Engineering support to Software Provenance and Supply Chain Risk Management Planning: Develop Campaign Plan and implementation plan for "Deliver Uncompromised" initiatives, Draft "101" type informational briefing materials, courseware inputs, ID and assess info sharing tools, development of draft policy/procedures documents. Deliver a 180 day status report & draft final Congressional Pilot reports, Provide Technical/ Engineering Support to Agile Acquisition Pilots. - Defense Science Board Software Recommendations Implementation: Develop practical approaches to encourage adoption of game-changing software development and sustainment approaches that will deliver capabilities that catalyze greater mission impact to the warfighter and Enterprise more rapidly while better controlling cost and improving resilience in the current and emerging cyber threat environment. Develop a draft Implementation Strategic Roadmap that identifies short, medium, and long-term goals for each of the DSB recommendations. It will identify likely risk areas, develop risk reduction approaches, and propose appropriate metrics for new programs that will better reflect the health of software programs undergoing modernization 			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0604771D8Z / <i>Joint Tactical Information Distribution System (JTIDS)</i>	Project (Number/Name) 771 / <i>Link-16 Tactical Data Link (TDL) Transformation</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>or in development. Approaches to develop software sustainment plans that embrace these recommendations will be explored and productive implementation guidance will be produced, critiqued, and shared with the applicable software development and sustainment work force professionals.</p> <ul style="list-style-type: none"> - Innovative Acquisition Approaches: Develop or enhance innovative acquisition approaches across hardware, software, IT infrastructure and services acquisition policy and processes to better align with best practices and modern technology approaches. Facilitate widespread adoption of rapid acquisition paths through translating lessons learned/best practices into policy, guidance, and training products and tools, working in partnership with the Acquisition Accelerator sponsored by Strategy Data & Design. <p>P&WP:</p> <ul style="list-style-type: none"> - Continues Air Defense Offensive Counter Air (ADOCA) F-35 support to advise OUSD (A&S) and OASD (A) senior leaders on strategies to produce, develop, and sustain the F-35 Lightning II program and worldwide fleet of aircraft. Provides expert acquisition/program support to enable PPBE planning for the F-35 POM and overall program requirements development. - Enables the following Mission Engineering capabilities: Develop and manage effects kill chains and enabling architectures. Work with engineers and architects to translate operational needs to capabilities and system networks. Implement kill chains in modeling and simulation environments and execute effects/kill chain performance assessments. Compile and lend meaning to large amounts of program capability data. - Carries on Maneuver Element analytical effort to exploit firepower and attrition on key elements of opposing forces. <p><i>FY 2019 to FY 2020 Increase/Decrease Statement:</i></p> <p>Decrease in funding impacts the DASDs ability to conduct studies and analysis addressing complex command and communications issues.</p>			
Accomplishments/Planned Programs Subtotals		19.268	20.207
C. Other Program Funding Summary (\$ in Millions)			
N/A			
Remarks			
D. Acquisition Strategy			
<p>In executing JTDL tasking, existing fixed-price and cost-plus contracts will be utilized.</p> <ul style="list-style-type: none"> - Program reviews in support of the JCIDS, acquisition and PPBE processes. 			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0604771D8Z / <i>Joint Tactical Information Distribution System (JTIDS)</i>	Project (Number/Name) 771 / <i>Link-16 Tactical Data Link (TDL) Transformation</i>
E. Performance Metrics Enterprise-Wide Alignment: Accelerate DoD information age transformation to increase the effectiveness and efficiency of the warfighting, intelligence and business missions. Measures: <ul style="list-style-type: none">- Timely development and issuance of policy and guidance- Instantiation of enterprise-wide system engineering for the Joint Information Environment (JIE) Portfolio Management: Provide for the timely and effective delivery of key Net-Centric capabilities through portfolio management of associated technology development and Major Defense Acquisition Programs (MDAPS) and Major Automated Information Systems (MAIS). Measures: <ul style="list-style-type: none">- Key milestones completed for major net-centric acquisitions- Number of major systems successfully completing net-centric critical performance reviews		

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense												Date: February 2019			
Appropriation/Budget Activity 0400 / 5						R-1 Program Element (Number/Name) PE 0604771D8Z I Joint Tactical Information Distribution System (JTIDS)				Project (Number/Name) 771 I Link-16 Tactical Data Link (TDL) Transformation					
Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Link-16 Tactical Data Link (TDL) Transformation	C/TBD	OUSD(AT&L)/ OASD(A)/ DASD(C3CB) : Pentagon	92.650	19.268		20.207		12.563		-		12.563	-	-	-
Subtotal			92.650	19.268		20.207		12.563		-		12.563	-	-	N/A
Remarks NA															
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			92.650	19.268		20.207		12.563		-		12.563	-	-	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.															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense																				Date: February 2019					
Appropriation/Budget Activity										R-1 Program Element (Number/Name)										Project (Number/Name)					
0400 / 5										PE 0604771D8Z / Joint Tactical Information Distribution System (JTIDS)										771 / Link-16 Tactical Data Link (TDL) Transformation					

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Office of the Secretary Of Defense			Date: February 2019
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0604771D8Z / <i>Joint Tactical Information Distribution System (JTIDS)</i>	Project (Number/Name) 771 / <i>Link-16 Tactical Data Link (TDL) Transformation</i>	

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>Link-16 Comm Tactical Data Link (TDL) Transformation</i>				
Contract Awards	2	2019	4	2021

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
105: Cyber Capability & Platform Resilience	8.420	5.000	14.218	12.539	-	12.539	4.742	3.030	2.990	3.053	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Provides resources for developmental acquisition support and portfolio management (to include the Cyber Investment and Management Board (CIMB)) of Cyber capabilities as the Department conceives, develops, and rapidly fields cyber capabilities for Cyberspace Operations and the instantiation of cyber resilient platforms and weapons systems for priority kinetic and non-kinetic missions. The CIMB was established in 2012 in response to the FY2011 NDAA Section 933, where DoD was directed to provide a strategy for the rapid acquisition of cyber capabilities, for cyber warfare for USCC and the Cyber Service components of the military departments. USD(A&S) is responsible for compliance with the FY2011 NDAA and Chairs the CIMB. 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, executive support of CIMB, enterprise wide systems engineering and operational impact analyses related to Cyber capabilities and ensuring cyber resilience within systems and platforms. Resources will also be used to provide expertise required for exercising technical direction over design, performance, cost parameters, 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 2018	FY 2019	FY 2020
Title: Cyber Capability and Platform Resilience	5.000	14.218	12.539
Description: Provides resources for developmental acquisition support and portfolio management (to include the Cyber Investment and Management Board (CIMB)) of Cyber capabilities as the Department conceives, develops, and rapidly fields cyber capabilities for Cyberspace Operations and the instantiation of cyber resilient platforms and weapons systems for priority kinetic and non-kinetic missions. The CIMB was established in 2012 in response to the FY2011 NDAA Section 933, where DoD was directed to provide a strategy for the rapid acquisition of cyber capabilities, for cyber warfare for USCC and the Cyber Service components of the military departments. USD(A&S) is responsible for compliance with the FY2011 NDAA and Chairs the CIMB. 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, executive support of CIMB, enterprise			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0604771D8Z / <i>Joint Tactical Information Distribution System (JTIDS)</i>	Project (Number/Name) 105 / <i>Cyber Capability & Platform Resilience</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>wide systems engineering and operational impact analyses related to Cyber capabilities and ensuring cyber resilience within systems and platforms. Resources will also be used to provide expertise required for exercising technical direction over design, performance, cost parameters, 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.</p> <p>FY 2019 Plans:</p> <ul style="list-style-type: none"> - Cyber Investment Management: Synchronize and coordinate cyberspace acquisition activities, conduct quantitative assessments, and ensure cyberspace investments align with Department priorities, required capabilities and evolving cyber threats. Provide support of the Cyber Investment Management Board and develop implementation guidance and associated direction that provides strategic guidance and feedback to senior leaders. Continue to plan and conduct CIMB/CCT meetings to refine the cyber investment portfolio, review execution of cyber requirements and acquisition processes, and to identify strategic cyber issues the DoD will face in the future. - Refine the Cyber investment portfolio results, ensuring return on investment and risk ultimately leading to an optimization phase focusing on process improvement is included. - Conduct investment analysis of the DoD-wide Cyber Special Access Program (SAP) portfolio to include return on investment and risk analysis. - Continue oversight of implementation of the Cyber Situational Awareness EoA (phase II) recommendations. - As Principal Staff Assistant OPR for the Unified Platform (UP), oversee the Air Force's, as DoD Executive Agent, capability development via portfolio management and governance. Assess UP's interfaces, dependencies, and linkages with other components of the Joint Cyber Warfighting Architecture to enable effective and efficient offensive and defensive effects. - Continue oversight of Joint Cyber Command and Control (C2) capability development. - Ensure Platform Resilience/Mission Assurance (PR/MA); Oversee implementation of the recommendations on Cyber vulnerabilities of Department of Defense weapon systems and tactical communications systems. - Ensure execution of the evaluation of cyber vulnerabilities of DoD critical infrastructure plan. Conduct data gathering and technical assessments to support the development of meaningful acquisition requirements for the PCTE and other programs of interest as they relate to capabilities of diverse DoD cyber range capabilities. - Manage the portfolio of DoD cyber training systems (includes DoD Persistent Cyber Training Environment (PCTE)); govern the PCTE as a member of the PCTE governance boards. - Continue to synchronize and govern the DoD Cyber Ranges that support Cyber Training and Testing & Evaluations as a member of the Cyber Ranges governance boards. Implement DoD Cyber Strategy by incorporating the cyber ranges reference architecture into the Joint Cyber Warfighting Architecture. 			
			FY 2020

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0604771D8Z / <i>Joint Tactical Information Distribution System (JTIDS)</i>	Project (Number/Name) 105 / <i>Cyber Capability & Platform Resilience</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>- With USCYBERCOM, manage the portfolio of Joint Cyber Warfighting Architecture components to enable the cyber mission force to efficiently and effectively conduct offensive and defensive cyber missions. Supports offensive and defensive architecture development and portfolio management in collaboration with USCYBERCOM.</p> <p>- Joint Cyber C2: Continue oversight of Joint Cyber Command and Control (C2) capability development. Upon request, support implementation of the preferred alternative identified during the Joint Cyber C2 AoA. Continue oversight of implementation of the Cyber Situational Awareness EoA (phase II) recommendations. Track the status and provide technical recommendations associated with piloting efforts associated with the recommendations.</p> <p>FY 2020 Plans:</p> <p>- With USCYBERCOM, manage the portfolio of Joint Cyber Warfighting Architecture components to enable the cyber mission force to efficiently and effectively conduct offensive and defensive cyber missions. Supports offensive and defensive architecture development and portfolio management in collaboration with USCYBERCOM.</p> <p>- Manage the portfolio of DoD cyber training systems (includes DoD Persistent Cyber Training Environment (PCTE)); govern the PCTE as a member of the PCTE governance boards.</p> <p>- As Principal Staff Assistant OPR for the Unified Platform (UP), oversee the Air Force's, as DoD Executive Agent, capability development via portfolio management and governance. Assess UP's interfaces, dependencies, and linkages with other components of the Joint Cyber Warfighting Architecture to enable effective and efficient offensive and defensive effects.</p> <p>- Ensure Platform Resilience/Mission Assurance (PR/MA); Oversee implementation of the recommendations on Cyber vulnerabilities of Department of Defense weapon systems and tactical communications systems.</p> <p>- Ensure execution of the evaluation of cyber vulnerabilities of DoD critical infrastructure plan. Conduct data gathering and technical assessments to support the development of meaningful acquisition requirements for the PCTE and other programs of interest as they relate to capabilities of diverse DoD cyber range capabilities.</p> <p>- Defense Industrial Base (DIB) Secure Cloud Managed Services Pilot:</p> <p>-- Conduct pilot to demonstrate and provide scalable and cost-effective cloud and managed cybersecurity services for Defense Industrial Base (DIB) companies to protect DoD controlled unclassified information. Focus cloud and cybersecurity services towards a subset of small-to-medium sized DIB companies that support prioritized, critical DoD missions and programs. The vast majority of the DIB sector consists of small-to-medium sized companies that lack sufficient cybersecurity capabilities to protect controlled unclassified information from a determined adversary.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Increase in funds for Cyber efforts.</p>			
Accomplishments/Planned Programs Subtotals		5.000	14.218
			12.539

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0604771D8Z / <i>Joint Tactical Information Distribution System (JTIDS)</i>	Project (Number/Name) 105 / <i>Cyber Capability & Platform Resilience</i>
C. Other Program Funding Summary (\$ in Millions) N/A		
Remarks		
D. Acquisition Strategy Existing firm fixed priced and cost plus contracts will be utilized.		
E. Performance Metrics Enterprise-Wide Cyber Investments: instantiation of cyber capabilities for resilient systems include risk assessments, vulnerability assessments, mitigation plans, prototype architectures, investment strategies, trends analyses, Evaluation/Analysis of Alternatives, integrated mission analyses, technical and policy guidance directives. Measures: - Timely development and issuance of policy and guidance - Timely delivery and development of key investment strategies, trend analysis and outcomes of the Evaluation/Analysis of Alternatives. Portfolio Management: Provide for the timely and effective delivery of portfolio management support of associated with Cyber Security and Major Defense Acquisition Programs (MDAPS) and Major Automated Information Systems (MAIS). Measures: - Key milestones completed for major cyber related acquisitions		

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense													Date: February 2019		
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)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Contract awards	C/CPFF	OUSD AT&L DASD C3CB : Pentagon/ Mark Center	8.420	5.000	Feb 2019	14.218	Feb 2020	12.539		-		12.539	Continuing	Continuing	-
Subtotal			8.420	5.000		14.218		12.539		-		12.539	Continuing	Continuing	N/A
Remarks NA															
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			8.420	5.000		14.218		12.539		-		12.539	Continuing	Continuing	N/A
Remarks NA															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense			Date: February 2019
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	

	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Cyber Capability and Platform Resilience																												
Contract Awards																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Office of the Secretary Of Defense			Date: February 2019
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0604771D8Z / <i>Joint Tactical Information Distribution System (JTIDS)</i>	Project (Number/Name) 105 / <i>Cyber Capability & Platform Resilience</i>	

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>Cyber Capability and Platform Resilience</i>				
Contract Awards	2	2019	4	2021

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 5					R-1 Program Element (Number/Name) PE 0604771D8Z I Joint Tactical Information Distribution System (JTIDS)				Project (Number/Name) 028 I DIB Secure Cloud Managed Services Pilot			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
028: DIB Secure Cloud Managed Services Pilot	0.000	0.000	0.000	15.000	-	15.000	10.000	0.000	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		
A. Mission Description and Budget Item Justification												
Conduct pilot to demonstrate and provide scalable and cost-effective cloud and managed cybersecurity services for Defense Industrial Base (DIB) companies to protect DoD controlled unclassified information. Focus cloud and cybersecurity services towards a subset of small-to-medium sized DIB companies that support prioritized, critical DoD missions and programs. The vast majority of the DIB sector consists of small-to-medium sized companies that lack sufficient cybersecurity capabilities to protect controlled unclassified information from a determined adversary.												
B. Accomplishments/Planned Programs (\$ in Millions)									FY 2018	FY 2019	FY 2020	
Title: DIB Secure Cloud Managed Services Pilot									0.000	-	15.000	
Description: Conduct pilot to demonstrate and provide scalable and cost-effective cloud and managed cybersecurity services for Defense Industrial Base (DIB) companies to protect DoD controlled unclassified information. Focus cloud and cybersecurity services towards a subset of small-to-medium sized DIB companies that support prioritized, critical DoD missions and programs. The vast majority of the DIB sector consists of small-to-medium sized companies that lack sufficient cybersecurity capabilities to protect controlled unclassified information from a determined adversary.												
FY 2020 Plans:												
Conduct pilot to demonstrate and provide scalable and cost-effective cloud and managed cybersecurity services for Defense Industrial Base (DIB) companies to protect DoD controlled unclassified information. Focus cloud and cybersecurity services towards a subset of small-to-medium sized DIB companies that support prioritized, critical DoD missions and programs. The vast majority of the DIB sector consists of small-to-medium sized companies that lack sufficient cybersecurity capabilities to protect controlled unclassified information from a determined adversary.												
FY 2019 to FY 2020 Increase/Decrease Statement:												
\$15M Congressional Add for DIB Cloud Pilot in FY20												
Accomplishments/Planned Programs Subtotals									0.000	-	15.000	
C. Other Program Funding Summary (\$ in Millions)												
N/A												
Remarks												

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0604771D8Z / Joint Tactical Information Distribution System (JTIDS)	Project (Number/Name) 028 / DIB Secure Cloud Managed Services Pilot
D. Acquisition Strategy N/A		
E. Performance Metrics NA		

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense												Date: February 2019		
Appropriation/Budget Activity 0400 / 5					R-1 Program Element (Number/Name) PE 0604771D8Z / <i>Joint Tactical Information Distribution System (JTIDS)</i>					Project (Number/Name) 028 / <i>DIB Secure Cloud Managed Services Pilot</i>				

Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Management Services/ Support	C/TBD	TBD : TBD	-	-		-		15.000		-		15.000	Continuing	Continuing	-
Subtotal			-	-		-		15.000		-		15.000	Continuing	Continuing	N/A

	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-	0.000	15.000	-	15.000	Continuing	Continuing	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense			Date: February 2019
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0604771D8Z / Joint Tactical Information Distribution System (JTIDS)	Project (Number/Name) 028 / DIB Secure Cloud Managed Services Pilot	

	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
DIB Secure Managed Services Pilot																												
DIB Secure Managed Services Pilot																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Office of the Secretary Of Defense			Date: February 2019
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0604771D8Z / <i>Joint Tactical Information Distribution System (JTIDS)</i>	Project (Number/Name) 028 / <i>DIB Secure Cloud Managed Services Pilot</i>	

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>DIB Secure Managed Services Pilot</i>				
DIB Secure Managed Services Pilot	4	2019	3	2021

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity					R-1 Program Element (Number/Name)							
0400: Research, Development, Test & Evaluation, Defense-Wide / BA 5: System Development & Demonstration (SDD)					PE 0605022D8Z / Defense Exportability Program							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	14.235	2.088	1.486	17.615	-	17.615	14.445	11.883	11.803	21.119	Continuing	Continuing
013: Defense Exportability Features (DEF) Program	14.235	2.088	1.486	17.615	-	17.615	14.445	11.883	11.803	21.119	Continuing	Continuing

Note

The increase in funds for the Defense Exportability Features (DEF) Program for FY20-24 reflects Department of Defense commitments to expand the application of exportability activities in acquisition programs, activities which closely align with the three priority lines of effort outlined in the 2018 National Defense Strategy: 1) increasing lethality, by building technology protection features into U.S. defense systems to maintain the U.S. competitive military edge; 2) strengthening alliances and partnerships, by deepening interoperability with coalition partners; and 3) improving business practices, by helping decrease costs for the DoD and foreign partners via greater economies of scale. 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.

A. Mission Description and Budget Item Justification

The Defense Exportability Features (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 United States Government/DoD efforts to build partnership capacity. Funds support building joint and coalition environments by enabling the export of DoD systems to a wide range of partner nations, resulting in improved security and interoperability. In addition to the operational benefits, by providing these resources up front, the United States and partner nations will save significant resources by more efficiently designing and producing exportable U.S. systems.

Failure to consider export variant designs early in the acquisition process results in increased costs, delayed delivery, and higher risk of sensitive technology compromise due to ad-hoc sales later in production. Early development of export variants, including systems design approaches to integrate exportable anti-tamper protection and differential capability requirements to lower production costs, makes it possible to improve quality and timely deliveries to allies and friends, and may enhance US industry share of the global marketplace.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 5: System Development & Demonstration (SDD)</i>	R-1 Program Element (Number/Name) PE 0605022D8Z I <i>Defense Exportability Program</i>
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B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	3.162	1.489	3.698	-	3.698
Current President's Budget	2.088	1.486	17.615	-	17.615
Total Adjustments	-1.074	-0.003	13.917	-	13.917
• Congressional General Reductions	-1.000	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.070	-			
• FFRDC	-0.004	-0.003	-	-	-
• Department's Realignment	-	-	13.917	-	13.917

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 5					R-1 Program Element (Number/Name) PE 0605022D8Z / Defense Exportability Program				Project (Number/Name) 013 / Defense Exportability Features (DEF) Program			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
013: Defense Exportability Features (DEF) Program	14.235	2.088	1.486	17.615	-	17.615	14.445	11.883	11.803	21.119	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Defense Exportability Features (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 United States Government/DoD efforts to build partnership capacity. Funds support building joint and coalition environments by enabling the export of DoD systems to a wide range of partner nations, resulting in improved security and interoperability. In addition to the operational benefits, by providing these resources up front, the United States and partner nations will save significant resources by more efficiently designing and producing exportable U.S. systems.

Failure to consider export variant designs early in the acquisition process results in increased costs, delayed delivery, and higher risk of sensitive technology compromise due to ad-hoc sales later in production. Early development of export variants, including systems design approaches to integrate exportable anti-tamper protection and differential capability requirements to lower production costs, makes it possible to improve quality and timely deliveries to allies and friends, and may enhance US industry share of the global marketplace.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
Title: Defense Exportability Features (DEF) Program	2.088	1.486	17.615
FY 2019 Plans: Designated systems participating in the DEF Program in FY19 continue to define and implement DEF 'best practices' related to technology protection in the areas of system engineering, program management, and program protection measures. Failure to assess DEF considerations early in the acquisition process results in increased costs, delays in delivery, and higher risk of critical technology compromise. Funding decreases in FY 2019 compared to subsequent fiscal years, however, the Program anticipates supporting some of the Department's most important modernization efforts such as the Three Dimensional Expeditionary Long Range Radar (3DELRR) and Future Vertical Lift (FVL) programs, and the DEF Program has greater need from participating programs than there are available funds to disburse for FY2019.			
FY 2020 Plans:			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0605022D8Z / <i>Defense Exportability Program</i>	Project (Number/Name) 013 / <i>Defense Exportability Features (DEF) Program</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
Guided by National Defense Strategy priority lines of effort, DEF Program efforts will expand funding support for priority acquisition programs with a view to building international partner capability, improved coalition interoperability, and improved readiness of U.S. and coalition forces.			
<i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> FY 2019 to FY 2020 increase is driven by Departmental priorities to expanded exportability efforts to align with National Defense Strategy priority lines of effort: 1) increase lethality, 2) strengthen alliances and partnerships, 3) improve DoD business practices.			
Accomplishments/Planned Programs Subtotals		2.088	1.486
C. Other Program Funding Summary (\$ in Millions) N/A			
Remarks			
D. Acquisition Strategy N/A			
E. Performance Metrics N/A			

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0605022D8Z / Defense Exportability Program	Project (Number/Name) 013 / Defense Exportability Features (DEF) Program
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Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
DEF	TBD	Various : Various	14.235	2.088		1.486		17.615		-		17.615	Continuing	Continuing		-
Subtotal			14.235	2.088		1.486		17.615		-		17.615	Continuing	Continuing		N/A

Remarks

The increase in funds for the Defense Exportability Features (DEF) Program for FY20-24 reflects Department of Defense commitments to expand the application of exportability activities in acquisition programs, activities which closely align with the three priority lines of effort outlined in the 2018 National Defense Strategy: 1) increasing lethality, by building technology protection features into U.S. defense systems to maintain the U.S. competitive military edge; 2) strengthening alliances and partnerships, by deepening interoperability with coalition partners; and 3) improving business practices, by helping decrease costs for the DoD and foreign partners via greater economies of scale. 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.

	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	14.235	2.088	1.486	17.615	-	17.615	Continuing	Continuing	N/A

Remarks

The increase in funds for the Defense Exportability Features (DEF) Program for FY20-24 reflects Department of Defense commitments to expand the application of exportability activities in acquisition programs, activities which closely align with the three priority lines of effort outlined in the 2018 National Defense Strategy: 1) increasing lethality, by building technology protection features into U.S. defense systems to maintain the U.S. competitive military edge; 2) strengthening alliances and partnerships, by deepening interoperability with coalition partners; and 3) improving business practices, by helping decrease costs for the DoD and foreign partners via greater economies of scale. 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.

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0605022D8Z / <i>Defense Exportability Program</i>	Project (Number/Name) 013 / <i>Defense Exportability Features (DEF) Program</i>
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DEF Project Plan							
<u>Project Plan</u>	10/1/2018	10/1/2019	10/1/2020	10/1/2021	10/1/2022	10/1/2023	10/1/2024
FY 2018 Project Execution							
FY 2019 Project Execution							
FY 2020 Project Execution							
FY 2021 Project Execution							
FY 2022 Project Execution							
FY 2023 Project Execution							
FY 2024 Project Execution							

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Office of the Secretary Of Defense			Date: February 2019
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0605022D8Z / <i>Defense Exportability Program</i>	Project (Number/Name) 013 / <i>Defense Exportability Features (DEF) Program</i>	

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>Defense Exportability Features (DEF)</i>				
FY 2018	1	2018	4	2019
FY 2019	1	2019	4	2020
FY 2020	1	2020	4	2021
FY 2021	1	2021	4	2022
FY 2022	1	2022	4	2023
FY 2023	1	2023	4	2024
FY 2024	1	2024	4	2024

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity	R-1 Program Element (Number/Name)											
0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 5: System Development & Demonstration (SDD)</i>	PE 0605027D8Z I OUSD(C) IT Development Initiative											
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	56.134	21.312	9.568	15.653	-	15.653	14.274	14.555	14.893	15.266	Continuing	Continuing
927: <i>Next Generation Resource Management System</i>	39.984	0.000	8.068	8.134	-	8.134	8.181	8.279	8.429	8.608	Continuing	Continuing
930: <i>Defense Repository for Common Enterprise Data</i>	16.150	21.312	1.500	7.519	-	7.519	6.093	6.276	6.464	6.658	Continuing	Continuing

Note
BUDGET REQUEST JUSTIFICATION: +\$15.653 million is required to support the following efforts:

+ \$8.134 million is required to support Next Generation Resource Management Systems.

+ \$7.519 million is required to support Defense Repository for Common Enterprise Data.

FY18 funding of \$21.312 was in 927 instead of 930.

A. Mission Description and Budget Item Justification

As the Department of Defense strategic, operational, and tactical plans and objectives transform the war fighter with new capabilities and doctrine, the budgeting and accountability of funds used to pursue the Department objectives will become more complicated and detailed for senior leaders to make decisions with supporting rationale for the taxpayer. Incorporating information technology toward current and emerging business processes manifesting into a state-of-the art system of systems will result in increasing efficiencies, timely diagnostics, and reducing lifecycle costs to maintain, sustain and repair.

This initiative exploits emerging technology, processes, trends, capabilities, and techniques to incorporate state-of-the-art information technology enabling the ability, agility, and level of fidelity to collect, process, administrate and report resource management data and to automate business processes within a more robust analytical environment within the Office of the Under Secretary of Defense (Comptroller) OUSD(C).

NEXT GENERATION RESOURCE MANAGEMENT SYSTEM:

The Office of the Under Secretary of Defense (Comptroller) (OUSD(C)) is responsible for advising the Secretary of Defense on all Defense budgetary and fiscal matters, for Defense budget development and execution, and for overseeing financial management across the Department. The OUSD(C) has a broad set of responsibilities in supporting the Planning, Programing, Budget and Execution (PPBE) process. The Office of the Director, Cost Assessment and Program Evaluation (CAPE), provides independent analytic advice to the Secretary of Defense on all aspects of the Defense program, including alternative weapon systems and force structures, the development and evaluation of program and defense program alternatives, and the cost-effectiveness of defense systems.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
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	
<p>There is a critical need for the development of a state-of-the-art information technology system to modernize and replace multiple, antiquated legacy systems and processes used to formulate, justify, present and defend the entire Department of Defense Budget in the Office of the Under Secretary of Defense (Comptroller) (OUSD(C)) to meet Title 10 and Title 31 mission and reporting requirements. The Comptroller’s plan for mitigating the deficiencies and capability gaps associated with current systems is development of the Next Generation Resource Management System.</p> <p>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.</p> <p>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.</p> <p>The OUSD(C) requires capabilities that shall provide for the effective formulation, and justification of the Defense budget. The requirement is for:</p> <ul style="list-style-type: none">• 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 <p>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.</p> <p>DEFENSE REPOSITORY FOR COMMON ENTERPRISE DATA:</p> <p>Defense Repository for Common Enterprise data (DRCED) support financial audit, cost management, performance management, and readiness.</p> <p>The DoD DRCED requires:</p> <ul style="list-style-type: none">• All supporting Department data that rolls up to the DoD financial statement (detailed accounting data reconciled to the financial statement)• Proof of the completeness of all transactional data reported within the UoT (detailed accounting data reconciled to business events)• Ability to extract subset populations• Ability to secure and protect the data within the UoT <p>The failure to meet these requirements will result in the Department unable to successfully conduct and pass an audit.</p>		

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 5: System Development & Demonstration (SDD)</i>	R-1 Program Element (Number/Name) PE 0605027D8Z I OUSD(C) IT Development Initiative
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To achieve these requirements, the Office of the Under Secretary of Defense (Comptroller) is creating a tool called the Defense Repository for Common Enterprise Data (DRCED). This tool has the potential to significantly improve DoD's capability and capacity to handle large volumes of standard and non-standard business and readiness data. Both an application and analytical platform, the DRCED leverages an open-source software framework for storing data and running applications to deliver a complete DRCED.

The first phase of DRCED implementation is a proof of concept with the U.S. Special Operations Command (USSOCOM) systems to develop a baseline application and configuration. When the first phase has been successfully completed, the second phase will integrate into the full solution any remaining accounting and business feeder systems that execute TI-97 funds and be the solution for DATA Act. The proof of concept was successful and the program moved to an operations phase in FY18.

DRCED is a joint effort between Office of the Deputy Chief Financial Officer (ODCFO), Office of the Chief Management Officer (ODCMO), Office of the Chief Information Officer (OCIO), USSOCOM, and the Defense Finance and Accounting Service (DFAS).

FY19 develops and implements a SIPR environment for Cost Accounting Framework to meet Operations Security (OPSEC) and Information Security (INFOSEC) requirements

FY20 continues the development of a common enterprise data repository to aggregate and fuse multiple data sources to make business and analytical decisions, find data inconsistencies and improve financial audits across the DoD.

B. Program Change Summary (\$ in Millions)	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020 Base</u>	<u>FY 2020 OCO</u>	<u>FY 2020 Total</u>
Previous President's Budget	21.312	9.590	15.653	-	15.653
Current President's Budget	21.312	9.568	15.653	-	15.653
Total Adjustments	0.000	-0.022	0.000	-	0.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-0.022			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			

Change Summary Explanation

FY 2020 BUDGET REQUEST JUSTIFICATION: +\$8.134 million is required to support Next Generation Resource Management System (NGRMS).and \$7.519 million is required to support Defense Repository for Common Enterprise Data.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
927: Next Generation Resource Management System	39.984	0.000	8.068	8.134	-	8.134	8.181	8.279	8.429	8.608	Continuing	Continuing
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, Programming, Budget and Execution (PPBE) process. The Office of the Director, Cost Assessment and Program Evaluation (CAPE), provides independent analytic advice to the Secretary of Defense on all aspects of the Defense program, including alternative weapon systems and force structures, the development and evaluation of programs and defense program alternatives, and the cost-effectiveness of defense systems.

OUSD(C) and CAPE use multiple systems to formulate, justify, distribute, and execute DoD budgets. The information managed by the budget formulation and programming systems is redundant, and reconciliation of information is difficult and inefficient. These systems require extensive manpower investments to give executives the information they need to make key financial decisions in a timely manner.

The OUSD(C) and CAPE require a more efficient, effective Defense budget environment that optimizes the budget cycle to ensure users are processing and reporting efficiently and DoD Senior Leadership has the information to make informed, critical decisions.

The OUSD(C) requires capabilities that shall provide for the effective formulation, and justification of the Defense budget. The requirement is for:

- Automated exchange and reconciliation of budget data
- Improved efficiency through the utilization of a unified budgetary model
- Instantaneous ability to generate data for management reviews and decisions
- Capability to accommodate emerging business practices

Moving forward, the new “to be” system shall be designed as a single system with a unified data source for OUSD(C) and CAPE. The new system shall provide a single, integrated system that employs the latest technologies to fulfill the Department’s financial management responsibilities in an effective and efficient manner. The new system shall provide twenty-first century information technology that shall allow users to view information from multiple fully integrated modules simultaneously, e.g., current year budget submission, decision documents from previous years, and budget execution information.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
Title: Next Generation Resource Management System	0.000	8.068	8.134

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
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 2018	FY 2019
<p>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.</p> <p>FY 2019 Plans: FY 2019 planned development will include the build out of MilCloud Development environment, development of business processes for single submission of budget data, and the design and development of a single submission interface that provides a standardized Data Collection Form to populate a standardized Database Structure.</p> <p>FY 2020 Plans: FY 2020 planned development will include the development, Developmental and operational test, and deployment of the production interfaces. Development and developmental test of reporting/analytic tool will also be completed in FY 2020.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: The increase was due to the changes in the scope of NGRMS requirements.</p>			
Accomplishments/Planned Programs Subtotals		0.000	8.068
C. Other Program Funding Summary (\$ in Millions)			
N/A			
Remarks			
D. Acquisition Strategy			
Spiral development on a smaller scale to replace legacy mission system by leveraging existing resources..			
E. Performance Metrics			
N/A			

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense													Date: February 2019		
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)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Development	C/TBD	OUSD(C) : Pentagon & Contractor Off-site Facility	39.984	0.000	Dec 2019	8.068	Feb 2020	8.134	Dec 2020	-		8.134	Continuing	Continuing	-
Subtotal			39.984	0.000		8.068		8.134		-		8.134	Continuing	Continuing	N/A

	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	39.984	0.000	8.068	8.134	-	8.134	Continuing	Continuing	N/A

Remarks

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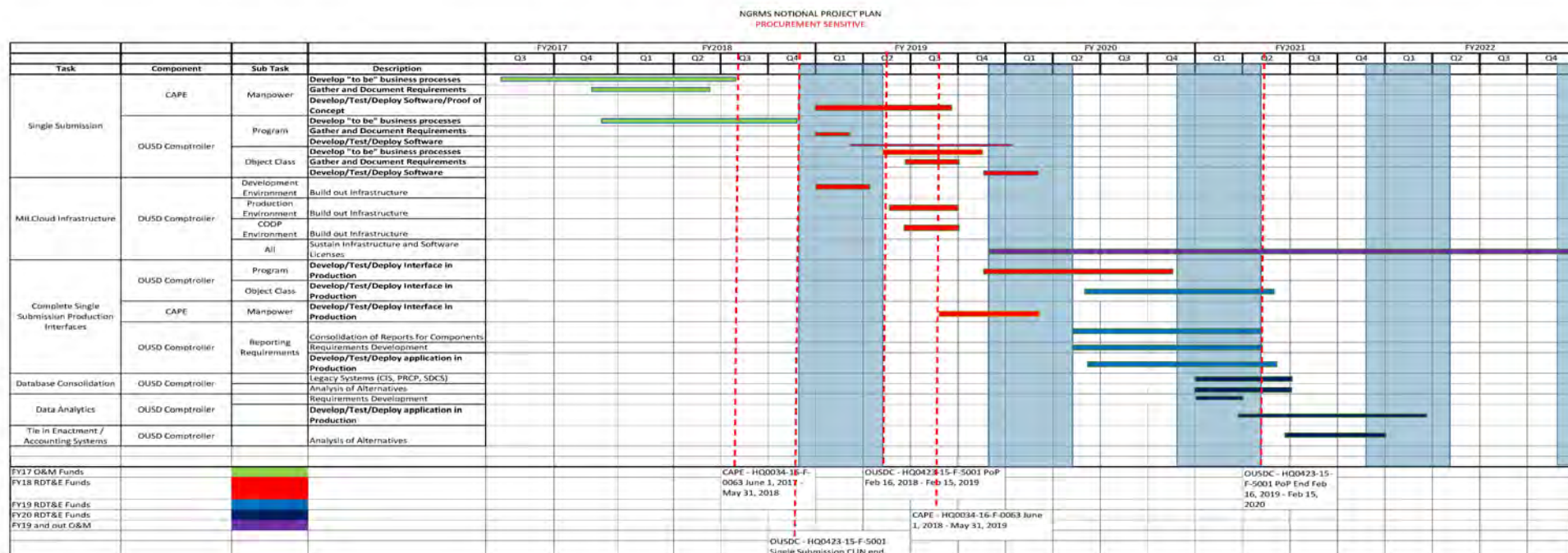
Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense

Date: February 2019

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



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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Office of the Secretary Of Defense			Date: February 2019
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

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
NGRMS Prototype				
Development	4	2018	3	2020

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 5					R-1 Program Element (Number/Name) PE 0605027D8Z / OUSD(C) IT Development Initiative				Project (Number/Name) 930 / Defense Repository for Common Enterprise Data			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
930: Defense Repository for Common Enterprise Data	16.150	21.312	1.500	7.519	-	7.519	6.093	6.276	6.464	6.658	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

FY18 funding was inr 927 instead of 930

A. Mission Description and Budget Item Justification

Without a single DRCED to support the TI97 General Fund for the 4th Estate the Department will be incapable of asserting readiness for an independent audit of the consolidated financial statements. All DoD organizations are pursuing the current statutory goal of achieving the state of audit that supports entry into a full financial statement of audit in FY 2018 with an initial opinion rendered in mid-FY 2019. Without an automated capability to provide a transactional universe for sampling and evidentiary proof the department will not be in compliance with public law.

The requested funds will be used to buy "Big Data" software and hardware infrastructure and required contractor services to implement the technology to meet the UoT requirement.

This funds include subject matter expertise costs for DCFO and funds to be placed on a contract for hardware, software, and labor. This will not result in hiring additional government personnel.

The UoT will have the capability to:

- Ingest data from multiple accounting and financial feeder systems
- Normalize data from multiple sources providing a common data architecture
- Reconcile transactional details to summary financial data
- Provide auditor's the ability to sample TI-97 detailed transactions
- Business Analytics/Reporting
- DATA Act which is a statutory requirement to be completed by May 2017
- Provide NIPR and SIPR capability for non-sensitive and sensitive data

This effort will expand in scope to support other enterprise analytics efforts like cost management, performance management, and readiness. The scope is to bring in data from an estimated 50 systems and demonstrate existence and completeness of business and accounting transaction data, which are capabilities required for audit readiness and other analytical use cases.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
Title: Defense Repository for Common Enterprise Data	21.312	1.500	7.519

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0605027D8Z / OUSD(C) IT Development Initiative	Project (Number/Name) 930 / Defense Repository for Common Enterprise Data	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>Description: Plan, develop, test and evaluate the system components (i.e. unified database, cross domain security, applications, services) and supportability requirements in creating a universe of transactions for the Defense Wide General Fund Appropriation financial audit, cost management, performance management, and readiness.</p> <p>The funds will be used to support increments three, four, five, and six per the schedule.</p> <p>FY 2019 Plans: FY19 develops and implements a SIPR environment for Cost Accounting Framework to meet Operations Security (OPSEC) and Information Security (INFOSEC) requirements</p> <p>FY 2020 Plans: FY20 continues the development of a common enterprise data repository to aggregate and fuse multiple data sources to make business and analytical decisions, find data inconsistencies and improve financial audits across the DoD.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: As we began planning the design of the long-term IT solution for the Cost Accounting Framework, we incorporated funding requirements into the Defense Repository for Common Enterprise Data FY18 budget to cover a NIPR solution. Since that budgeting exercise, it has become apparent that we will need funds in the FY19 budget for a SIPR environment to meet project Operations Security (OPSEC) and Information Security (INFOSEC) requirements. The FY19 funds are needed to support the additional scope of a SIPR implementation for the Cost Accounting Framework database and visualization application.</p>			
Accomplishments/Planned Programs Subtotals		21.312	1.500
C. Other Program Funding Summary (\$ in Millions) N/A			
Remarks			
D. Acquisition Strategy Leveraging existing contracts to develop and implement SIPR environment.			
E. Performance Metrics 97% of the Defense Agencies accounting systems reconcile to the unadjusted trial balance			

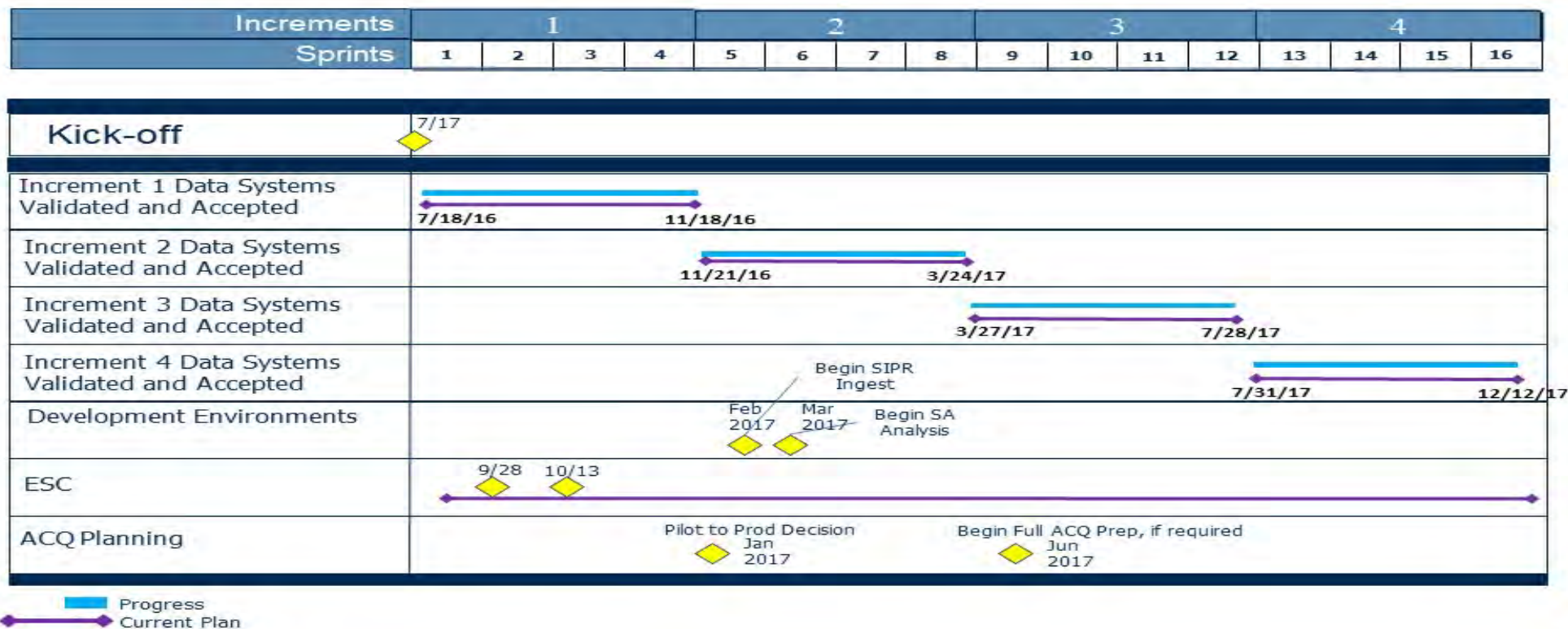
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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense												Date: February 2019			
Appropriation/Budget Activity 0400 / 5						R-1 Program Element (Number/Name) PE 0605027D8Z / OUSD(C) IT Development Initiative				Project (Number/Name) 930 / Defense Repository for Common Enterprise Data					
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Audit Analytics Task	C/TBD	OUSD(C) : Pentagon	16.150	21.312		0.315	May 2019	1.582	Aug 2019	-		1.582	Continuing	Continuing	-
Financial Analytics Task	C/TBD	OUSD(C) : Pentagon	-	-		0.060	May 2019	0.323	Aug 2019	-		0.323	Continuing	Continuing	-
Performance Analytics Task	C/TBD	OUSD(C) : Pentagon	-	-		0.255	May 2019	1.281	Aug 2019	-		1.281	Continuing	Continuing	-
Readiness Task	C/TBD	OUSD(C) : Pentagon	-	-		0.225	May 2019	1.086	Aug 2019	-		1.086	Continuing	Continuing	-
Technology Enablement Task	C/TBD	OUSD(C) : Pentagon	-	-		0.645	May 2019	3.247	Aug 2019	-		3.247	Continuing	Continuing	-
Subtotal			16.150	21.312		1.500		7.519		-		7.519	Continuing	Continuing	N/A
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			16.150	21.312		1.500		7.519		-		7.519	Continuing	Continuing	N/A
Remarks															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense										Date: February 2019					
Appropriation/Budget Activity 0400 / 5					R-1 Program Element (Number/Name) PE 0605027D8Z / OUSD(C) IT Development Initiative					Project (Number/Name) 930 / Defense Repository for Common Enterprise Data					

DRCED Schedule Overview

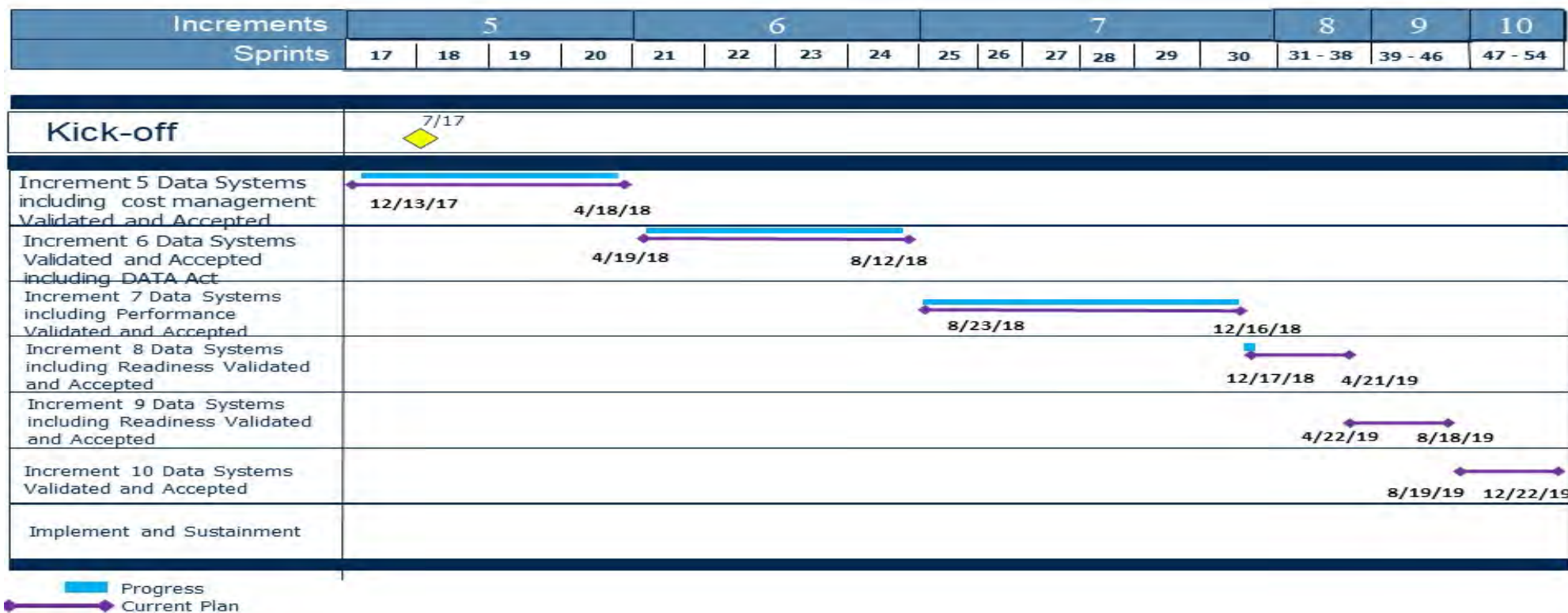


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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0605027D8Z / OUSD(C) IT Development Initiative	Project (Number/Name) 930 / Defense Repository for Common Enterprise Data

DRCED Schedule Overview Cont.



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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Office of the Secretary Of Defense			Date: February 2019
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0605027D8Z / OUSD(C) IT Development Initiative	Project (Number/Name) 930 / Defense Repository for Common Enterprise Data	

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Acquisiiton Milestone				
Cost management data in DRCED	1	2019	2	2019
Readiness pilot	2	2019	3	2019
Development of SIPR Environment for Cost Accounting Framework	3	2019	3	2020
Development and ingest further data	4	2019	3	2024

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity	R-1 Program Element (Number/Name)											
0400: Research, Development, Test & Evaluation, Defense-Wide I BA 5: System Development & Demonstration (SDD)	PE 0605075D8Z I CMO Policy and Integration											
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	90.240	2.805	2.100	1.618	0.000	1.618	1.650	1.677	1.707	1.743	Continuing	Continuing
075: CMO Policy and Integration	90.240	2.805	2.100	1.618	0.000	1.618	1.650	1.677	1.707	1.743	Continuing	Continuing

A. Mission Description and Budget Item Justification

To produce and sustain a Business Enterprise Architecture (BEA) to guide business transformation and business system investment actions for the DoD. The requirement to produce and maintain a BEA is codified in NDAA 2012, USC Title 10, Section 2222 with amplifying guidance from OMB. The proposed program provides improved capabilities to access and use the BEA information including descriptions of business processes and associated information assets; required capabilities and associated performance requirements; and governing laws, regulations and policies (LRPs).

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	2.810	2.105	1.623	0.000	1.623
Current President's Budget	2.805	2.100	1.618	0.000	1.618
Total Adjustments	-0.005	-0.005	-0.005	0.000	-0.005
• Congressional General Reductions	-0.005	-0.005			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Program Changes	-	-	-0.005	-	-0.005

Change Summary Explanation

FY18 & FY19 - Congressional General Reductions FFRDC reduction.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
075: CMO Policy and Integration	90.240	2.805	2.100	1.618	0.000	1.618	1.650	1.677	1.707	1.743	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		
A. Mission Description and Budget Item Justification												
To produce and sustain a Business Enterprise Architecture (BEA) to guide business transformation and business system investment actions for the DoD. The requirement to produce and maintain a BEA is codified in NDAA 2012, USC Title 10, Section 2222 with amplifying guidance from OMB. The proposed program provides improved capabilities to access and use the BEA information including descriptions of business processes and associated information assets; required capabilities and associated performance requirements; and governing laws, regulations and policies (LRPs).												
B. Accomplishments/Planned Programs (\$ in Millions)								FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: CMO Policy and Integration								2.805	2.100	1.618	0.000	1.618
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 2019 Plans: 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: • Developing and using functional strategies to enable and achieve DoD business mission initiatives, business process outcomes and investment decisions • Documenting and managing problem statement data that defines requirements for DOTMLPF capabilities and using them to support needs assessment, reuse and investment opportunities within and across Component and functional domains • Conducting cross functional business reviews to determine interdependencies of functional strategies, processes and systems, and to support business life-cycle optimization opportunities and improved net benefits. • Comprehensive system sustainment and transition analytics. Additionally, providing business intelligence and analytics (BIA) capabilities to support Financial system integration and detailed transaction reporting to meet audit readiness requirements. The BIA program												

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense				Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
includes technologies for integration with other DoD authoritative data sources, business intelligence reporting capabilities/tools, and requisite DoD data hosting center support. FY 2020 Base Plans: - Execute detailed implementation schedule - - 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: • Complete initial operating capability for BEA Improvements • Begin migration of capabilities from DISA computing environment to a secure DoD cloud service provider • Mature and support transition planning for business intelligence and analytics (BIA) capabilities to support financial system integration and detailed audit reporting. • Integrate BEA with ongoing DoD Reform initiatives. FY 2020 OCO Plans: N/A FY 2019 to FY 2020 Increase/Decrease Statement: Decrease anticipates continued ongoing development progress and further capability enhancements within the approved gov't cost estimate.						
Accomplishments/Planned Programs Subtotals		2.805	2.100	1.618	0.000	1.618
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.						
E. Performance Metrics						
Section 2222 of Title 10, USC required that a single Business Mission Area (BMA) Investment Review Board (IRB) be established. As part of the stand-up of this single IRB, Principal Staff Assistant (PSA) and DoD Components are charged with specifying and delivering required business outcomes for the Department. These business						

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0605075D8Z / <i>CMO Policy and Integration</i>	Project (Number/Name) 075 / <i>CMO Policy and Integration</i>
<p>outcomes are then incorporated into the architecture and data products making up the Department's Business Enterprise Architecture (BEA), under the oversight and direction of the Defense Business Council. These metrics measure the incorporation of the Component identified business outcomes and associated component organizational alignments into the BEA.</p> <ul style="list-style-type: none"> • FY 2018 Goal: 100% of BEA discoverable data artifacts transitioned to a government cloud based information environment. (*Partially Met) • FY 2019 Goal: 30% of business outcomes and Business Capability Acquisition Cycle performance data incorporated into the BEA. This metric measures the discoverability of BEA content that supports DoD decision making. • FY 2020 Goal: 75% of business outcomes and Business Capability Acquisition Cycle performance data incorporated into the BEA. This metric measures the discoverability of BEA content that supports DoD decision <p>Section 2222 of Title 10, USC further required that the defense business enterprise architecture include an information infrastructure to enable the producing of timely accurate and reliable business information. This metric measures the discoverability of BEA content that supports DoD decision making.</p> <ul style="list-style-type: none"> • FY 2018 Goal: 100% of BEA data artifacts are discoverable via web services. (*Partially Met) • FY 2019 Goal: 100% of BEA discoverable data artifacts transitioned to a government cloud based information environment. • FY 2020 Goal: 60% of defense business system investment and portfolio analytical products leverage the BEA cloud based information environment 		

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense												Date: February 2019					
Appropriation/Budget Activity 0400 / 5						R-1 Program Element (Number/Name) PE 0605075D8Z I CMO Policy and Integration						Project (Number/Name) 075 I CMO Policy and Integration					
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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		
Design Enterprise Architecture Taxonomy	Option/CPFF	DCMO : Mark Center	0.000	-		-		-		-		-	Continuing	Continuing	-		
Capability to automate and generate metadata on ingest of architecture information	Option/CPFF	DCMO : Mark Center	0.000	-		-		-		-		-	Continuing	Continuing	-		
Extend user access to BEA via web services	Option/CPFF	DCMO : Mark Center	0.000	2.805		2.100		1.300		0.000		1.300	Continuing	Continuing	-		
Port BEA into Cloud environment	Option/CPFF	DCMO : Mark Center	90.240	-		-		0.318		-		0.318	Continuing	Continuing	-		
Subtotal			90.240	2.805		2.100		1.618		0.000		1.618	Continuing	Continuing	N/A		
Remarks																	
* Partial completion of this performance metric is primarily the result of challenges in meeting the DoD's Cybersecurity Risk management Framework requirements necessary to transition capabilities from our contractor development site to an accredited DoD computing environment. The discover functionality is operating in the contractor's development environment but will require final hosting within a secure DoD computing environment to complete discovery capabilities via web services.																	
** DoD CIO Memorandum of 3 May 2018 directed migration of all 4th Estate applications and systems to milCloud 2.0 by end of FY2020																	
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract		
Project Cost Totals			90.240	2.805		2.100		1.618		0.000		1.618	Continuing	Continuing	N/A		
Remarks																	
NA																	

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

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
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Fiscal Year	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
BEA Compliance, Standards, and CMO Tools Implementations	1								1																			
	2																											
				3					3				3				3				3							
BEA computing infrastructure transition to DISA and Cloud Services Implementation			1		1																							
				2		2			3			3																
												4			4													

BEA Compliance, Standards, and CMO Tools Implementations	BEA computing infrastructure transition to DISA and Cloud Services Implementation
<ol style="list-style-type: none"> Design and deliver a restructured BEA technology solution BMA Business Capability Life Cycle (BCAC) tool development/deployment Implement performance initiatives associated with iterative development and delivery of capabilities to enhance BEA alignment across the enterprise 	<ol style="list-style-type: none"> Perform required computing architecture approvals, security compliance and infrastructure certifications in accordance with DoD Cybersecurity Risk Management Framework Develop and present compliance evidence required to obtain authorization to operate within the DISA enterprise computing ecosystem In accordance with DoD CIO direction, plan and implement technical design requirements and computing environment architecture requirements for BEA transition to a secure DoD cloud service provider Tailor and configure BEA hardware and software applications and operational parameters to leverage evolving DoD-approved cloud service provider capabilities

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity					R-1 Program Element (Number/Name)							
0400: Research, Development, Test & Evaluation, Defense-Wide I BA 5: System Development & Demonstration (SDD)					PE 0605210D8Z I Defense-Wide Electronic Procurement Capabilities							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	67.498	11.414	6.359	9.619	0.000	9.619	9.134	8.009	8.155	8.209	Continuing	Continuing
021: Defense-Wide Electronic Procurement Capabilities-Contingency	67.498	11.414	6.359	9.619	-	9.619	9.134	8.009	8.155	8.209	Continuing	Continuing

Note

The FY2019 funding request was reduced by \$3.880 million to account for the availability of prior year execution balances.

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. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	11.870	6.374	9.980	-	9.980
Current President's Budget	11.414	6.359	9.619	-	9.619
Total Adjustments	-0.456	-0.015	-0.361	-	-0.361
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.433	-			
• FFRDC	-0.023	-0.015	-	-	-
• INV-D-032 CDBP - Biological and Chemical Threats Preparedness	-	-	-0.361	-	-0.361

Change Summary Explanation

Other economic adjustments totaled \$.084M.

Funds rephased from FY19 to FY20 and FY21 to aid in increasing program execution rates closer to the DoD benchmarks.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
021: Defense-Wide Electronic Procurement Capabilities-Contingency	67.498	11.414	6.359	9.619	-	9.619	9.134	8.009	8.155	8.209	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 2018	FY 2019	FY 2020
Title: Defense-Wide Electronic Procurement Capabilities- Contingency	11.414	6.359	9.619
FY 2019 Plans: Critical to achieve enterprise procurement efficiencies and enterprise services specifically: 1) re-engineering of existing fraud and misuse data mining detection capability for purchase cards in DoD, 2) strengthen existing vendor identification systems in DoD to combat counterfeiting and cyber intrusion, 3) establish a single portal for solicitation access and proposal receipt from industry, 4) improve enterprise contract closeout tools, 5) continue implementation of contingency contracting end to end business tools for the warfighter. To strengthen internal controls for financial audit: 1) establish an end to end paperless reconciliation process for Government Furnished Property (GFP) in the hands of contractors, and 2) develop enterprise services to streamline procure to pay exchanges in partnership with the Comptroller.			
FY 2020 Plans: 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.			
FY 2019 to FY 2020 Increase/Decrease Statement:			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0605210D8Z / <i>Defense-Wide Electronic Procurement Capabilities</i>	Project (Number/Name) 021 / <i>Defense-Wide Electronic Procurement Capabilities- Contingency</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
The FY2019 funding request was reduced by \$3.880 million to account for the availability of prior year execution balances, other economic adjustments totaled \$.084M			
Accomplishments/Planned Programs Subtotals		11.414	9.619
C. Other Program Funding Summary (\$ in Millions) N/A			
Remarks			
D. Acquisition Strategy N/A			
E. Performance Metrics NA			

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense												Date: February 2019			
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)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Contract Business Systems Development	Various	DLA, JTIC, WPAFB : FORT BELVOIR, SCOTT AFB	64.951	10.508		5.533		9.619		-		9.619	-	-	-
Subtotal			64.951	10.508		5.533		9.619		-		9.619	-	-	N/A
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Interoperability Testing	Various	DLA, JTIC, WPAFB : FORT BELVOIR, SCOTT AFB	2.547	0.906		0.826		-		-		-	-	-	-
Subtotal			2.547	0.906		0.826		-		-		-	-	-	N/A
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			67.498	11.414		6.359		9.619		-		9.619	-	-	N/A
Remarks															

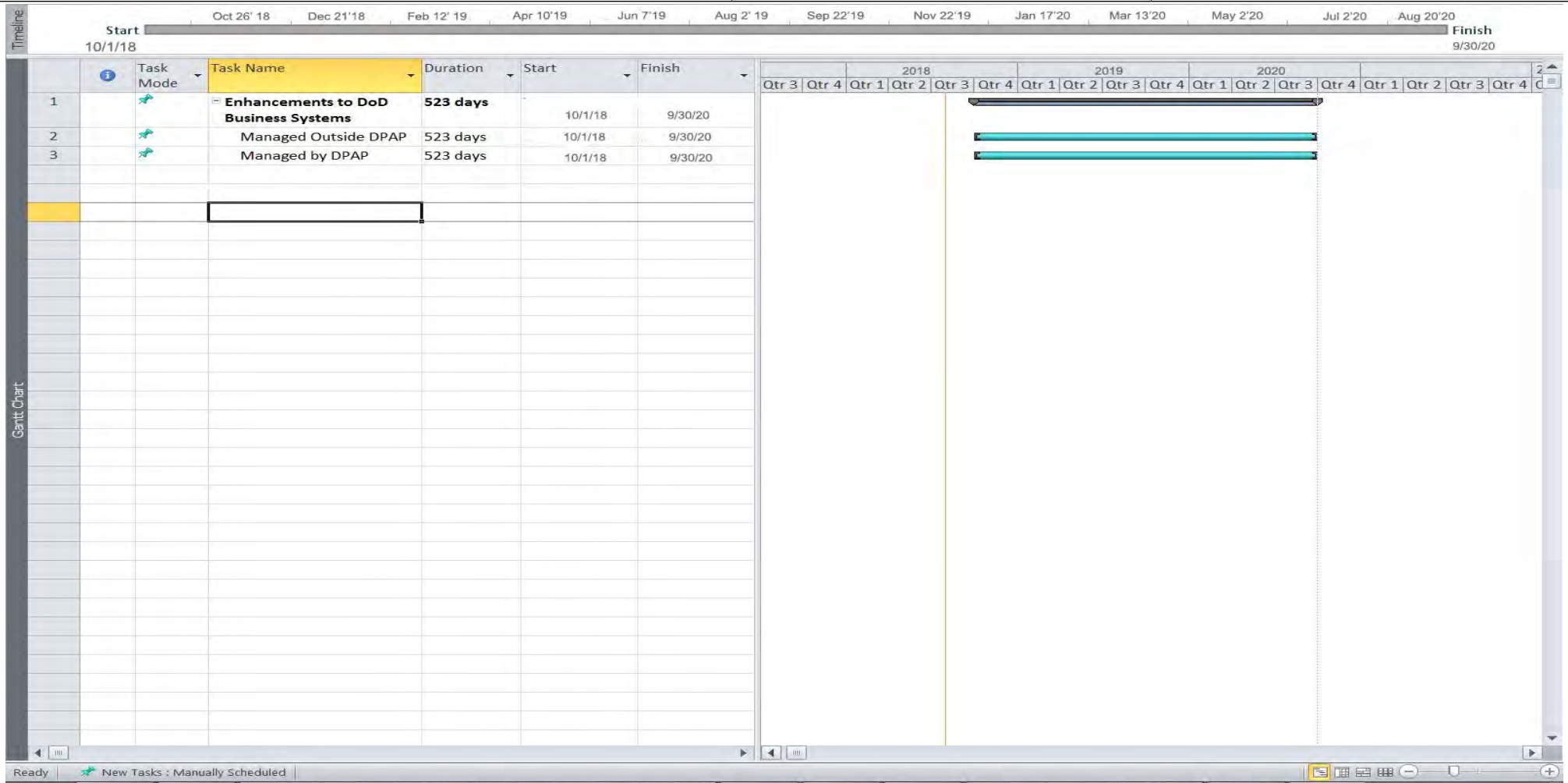
Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense

Date: February 2019

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



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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Office of the Secretary Of Defense			Date: February 2019
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0605210D8Z / <i>Defense-Wide Electronic Procurement Capabilities</i>	Project (Number/Name) 021 / <i>Defense-Wide Electronic Procurement Capabilities- Contingency</i>	

Schedule Details

Events by Sub Project	Start		End	
	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

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 5: System Development & Demonstration (SDD)</i>					R-1 Program Element (Number/Name) PE 0605294D8Z I <i>Trusted and Assured Microelectronics</i>							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	0.000	59.516	95.959	175.032	-	175.032	66.949	66.891	67.287	68.716	Continuing	Continuing
812: <i>Trusted Mask Trust Approach</i>	0.000	0.000	2.000	2.000	-	2.000	2.000	2.000	0.000	0.000	Continuing	Continuing
809: <i>New Trust Approach Demonstration</i>	0.000	59.516	13.098	13.381	-	13.381	23.215	23.101	25.547	25.724	Continuing	Continuing
822: <i>Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) Enhancement and Demonstration</i>	-	0.000	80.861	159.651	-	159.651	41.734	41.790	41.740	42.992	Continuing	Continuing

A. Mission Description and Budget Item Justification

Funding for the Microelectronic Innovation for National Security and Economic Competitiveness (MINSEC) activities were re-aligned from Project Number 809 to Project Number 822.

This Program Element (PE) supports activities to ensure critical and sensitive integrated circuits are available to meet the DoD's needs. It refines strategies and management planning activities that will: (1) provide support to acquisition programs to address trusted and assured microelectronics supply needs; (2) improve capability to evaluate and validate assurance of microelectronic parts and advance standards to incentivize the commercial marketplace to recognize hardware assurance as a competitive design standard; (3) develop and demonstrate alternative approaches to the DoD Trusted Foundry program to assure the microelectronics supply chain; and (4) provide access to advanced microelectronics that are vital to the national security and economic competitiveness for the U.S. government (USG) in order to enable DoD and broader USG access to commercial state-of-the-art (SOTA) microelectronics technology.

This PE supports the 2018 National Defense Strategy's (NDS) line of effort to build a more lethal force through modernization of key capabilities and 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.

This activity will be coordinated by the Office of the Under Secretary of Defense for Research and Engineering, and will include performers from the DoD Components, the Defense Microelectronics Activity (DMEA), the Joint Federated Assurance Center (JFAC), the Defense Advanced Research Programs Agency (DARPA), other DoD and Intelligence Community science and technology (S&T) organizations and laboratories, the defense industry, and the broader commercial industrial base. It will integrate the functions of the DoD Trusted Foundry Program, the Trusted Supplier accreditation program, JFAC, and related science and technology (S&T) activities.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 5: System Development & Demonstration (SDD)</i>	R-1 Program Element (Number/Name) PE 0605294D8Z I <i>Trusted and Assured Microelectronics</i>
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This activity implements, maintains, and updates the DoD's long-term microelectronics strategy. Additionally this activity places emphasis on incentivizing and proving new microelectronics technology solutions. Recognizing that ensured access to a trusted and assured supply of microelectronics is a 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.

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	61.084	56.178	57.194	-	57.194
Current President's Budget	59.516	95.959	175.032	-	175.032
Total Adjustments	-1.568	39.781	117.838	-	117.838
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	40.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-1.450	-			
• FFRDC Reduction	-0.118	-0.219	-	-	-
• Other Program Adjustments	-	-	-0.162	-	-0.162
• Adjustment for MINSEC P822	-	-	118.000	-	118.000

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

Project: 822: *Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) Enhancement and Demonstration*

Congressional Add: *Next Generation Microelectronics*

Congressional Add Subtotals for Project: 822

Congressional Add Totals for all Projects

FY 2018	FY 2019
-	40.000
-	40.000
-	40.000

Change Summary Explanation

FY 2019 funding in the amount of \$40 million was added to support acceleration efforts for MINSEC activities. FY 2020 funding in the amount of \$118 million was added to support a high-mix, low-volume enhanced microelectronics manufacturing domestic capability and a proactive awareness and security effort to identify and mitigate critical microelectronics supply chain threats.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 5					R-1 Program Element (Number/Name) PE 0605294D8Z / <i>Trusted and Assured Microelectronics</i>				Project (Number/Name) 812 / <i>Trusted Mask Trust Approach</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
812: <i>Trusted Mask Trust Approach</i>	0.000	0.000	2.000	2.000	-	2.000	2.000	2.000	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project staffs and supports operation of a new secure (SECRET-level) photomask manufacturing capability at an existing SOTA commercial photomask manufacturing supplier to secure the masks and design intellectual property (IP) of acquisition programs when using commercial microelectronic fabrication facilities other than the Trusted Foundry. This capability can be used in conjunction with one or more leading-edge commercial foundries. This capability will address trusted masks at technology node sizes less than 130 nanometers (nm) down to 14nm.

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
<p>Title: Trusted Mask Trust Approach</p> <p>FY 2019 Plans: Equipping and staffing of the new secure (SECRET-level) photomask manufacturing capability at the SOTA commercial photomask manufacturing supplier will be continued. DMEA will also continue to provide management and technical support, as required, to procure secure mask data parsing services for the Department, as well as other Federal entities, through operation of this Trusted photomask capability.</p> <p>FY 2020 Plans: Continuation of FY 2019 plan to equip and staff the new secure (SECRET-level) photomask manufacturing capability at the SOTA commercial photomask manufacturing supplier.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Level of effort is consistent between FY 2019 and FY 2020.</p>	0.000	2.000	2.000
Accomplishments/Planned Programs Subtotals	0.000	2.000	2.000

C. Other Program Funding Summary (\$ in Millions)
N/A

Remarks

D. Acquisition Strategy
N/A

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0605294D8Z / <i>Trusted and Assured Microelectronics</i>	Project (Number/Name) 812 / <i>Trusted Mask Trust Approach</i>

E. Performance Metrics

Performance for this project is monitored in the following ways:

- Number of photomasks created using the secure photomask manufacturing capability.
- Number of acquisition programs using the secure photomask manufacturing capability.
- Number of technology node sizes supported by the secure photomask manufacturing capability.
- Number of foundries supported by the secure photomask manufacturing capability.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense												Date: February 2019			
Appropriation/Budget Activity 0400 / 5						R-1 Program Element (Number/Name) PE 0605294D8Z / <i>Trusted and Assured Microelectronics</i>				Project (Number/Name) 812 / <i>Trusted Mask Trust Approach</i>					

Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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	
Trusted Mask Trust Approach	MIPR	Defense Microelectronics Activity (DMEA) : California	-	0.000		2.000	Mar 2019	2.000	Mar 2020	-		2.000	Continuing	Continuing	-	
Subtotal			-	0.000		2.000		2.000		-		2.000	Continuing	Continuing	N/A	

			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			-	0.000		2.000		2.000		-		2.000	Continuing	Continuing	N/A

Remarks
NA

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense			Date: February 2019
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0605294D8Z / <i>Trusted and Assured Microelectronics</i>	Project (Number/Name) 812 / <i>Trusted Mask Trust Approach</i>	

	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
<i>Trsuted mask facility operation</i>																												
Trusted mask facility operation																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Office of the Secretary Of Defense			Date: February 2019
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

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Trsuted mask facility operation				
Trusted mask facility operation	1	2019	4	2024

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 5					R-1 Program Element (Number/Name) PE 0605294D8Z / <i>Trusted and Assured Microelectronics</i>				Project (Number/Name) 809 / <i>New Trust Approach Demonstration</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
809: <i>New Trust Approach Demonstration</i>	0.000	59.516	13.098	13.381	-	13.381	23.215	23.101	25.547	25.724	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project funds a program of research to develop and 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 Joint Federated Assurance Center (JFAC) with regard to verification and validation in support of microelectronics assurance.

This program of research will demonstrate innovative design, manufacturing, imaging, tagging, and control and assessment approaches for protecting DoD's microelectronics supply chain and IP, including alternatives for trusted, strategic radiation-hardened electronics 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 and independent verification and validation of commercial designs. It also demonstrates and implements 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 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 trusted environments. The project will also support demonstration of a repository of third-party IP and electronic design automation (EDA) tools to expedite circuit design and transition promising technologies to use.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
Title: New Trust Approach Demonstration	59.516	13.098	13.381
FY 2019 Plans:			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0605294D8Z / <i>Trusted and Assured Microelectronics</i>	Project (Number/Name) 809 / <i>New Trust Approach Demonstration</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>Primary activities will continue to include demonstration of acquisition program pilots and technology demonstrations, followed by transition of these capabilities to new programs in the following fiscal years.</p> <p>These activities will continue to mature and evaluate assurance technologies and techniques through efforts that may include the conduct of studies, broad agency announcements (BAAs), and other efforts to coordinate research programs across USG R&D organizations, academia and industry.</p> <p>FY 2020 Plans: Continuation of FY 2019 activities including the following:</p> <ul style="list-style-type: none"> • Demonstrate acquisition program pilots and technology demonstrations, followed by transition of these capabilities to new programs in the following fiscal years • Evaluate assurance technologies and techniques through efforts that may include the conduct of studies, broad agency announcements (BAAs), and other efforts to coordinate research programs across USG R&D organizations, academia and industry • Identify potential transition issues and aid in transition through joint collaboration between research teams and stakeholders with a focus on evaluations of prototypes, test articles and beta versions of tools, IP, techniques, methods, etc. and their use in operationally-realistic scenarios. <p>FY 2019 to FY 2020 Increase/Decrease Statement: Level of effort is consistent between FY 2019 and FY 2020. Small changes reflect minor budget fluctuations.</p>			
Accomplishments/Planned Programs Subtotals		59.516	13.098
C. Other Program Funding Summary (\$ in Millions)			
N/A			
Remarks			
D. Acquisition Strategy			
N/A			
E. Performance Metrics			
<p>Performance for this project is monitored in the following ways:</p> <ul style="list-style-type: none"> • Effectiveness of developed technologies, as measured by: <ul style="list-style-type: none"> - The speed and reliability of new validation and verification techniques in identifying known microelectronics issues (e.g., tampering) in laboratory and non-laboratory situations. 			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0605294D8Z / <i>Trusted and Assured Microelectronics</i>	Project (Number/Name) 809 / <i>New Trust Approach Demonstration</i>
<ul style="list-style-type: none">- Successful testing of advanced, alternative manufacturing techniques, such as disaggregated manufacturing.- Resilience of microelectronics protected by new trust approach technologies in red teaming exercises.• Adoption of next-generation assurance technologies, as measured by:<ul style="list-style-type: none">- The number of DoD and other USG programs employing these assurance technologies, design approaches, or best practices.- The volume and criticality of components employing these technologies, design approaches, or best practices.- Promulgation in DoD guidance and program protection plans.		

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense												Date: February 2019			
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)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
New Trust Approach Demonstration Program Support	MIPR	Various (DARPA, Air Force, Army, Navy, NSA) : Various	-	59.516	Mar 2018	13.098	Mar 2019	13.381	Mar 2020	-		13.381	Continuing	Continuing	-
Subtotal			-	59.516		13.098		13.381		-		13.381	Continuing	Continuing	N/A
Remarks NA															
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			-	59.516		13.098		13.381		-		13.381	Continuing	Continuing	N/A
Remarks N/A															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense			Date: February 2019
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0605294D8Z / <i>Trusted and Assured Microelectronics</i>	Project (Number/Name) 809 / <i>New Trust Approach Demonstration</i>	

	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
<i>New Trust Approach Demonstration</i>																												
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 EDA tool repository development and demonstration																												
JFAC technical capability improvement development and demonstration																												
Microelectronics assurance and supply chain demonstrations																												
USG and industry engagement																												
Microelectronics assurance and supply chain policy and guidance development/update																												
Management/Technical Support																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Office of the Secretary Of Defense			Date: February 2019
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0605294D8Z / <i>Trusted and Assured Microelectronics</i>	Project (Number/Name) 809 / <i>New Trust Approach Demonstration</i>	

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>New Trust Approach Demonstration</i>				
FPGA integrated assurance analysis/logical and physical verification tool demonstration	1	2019	4	2024
Automated design and verification and demonstration	1	2019	4	2024
Validation of custom integrated circuits and demonstration	1	2019	4	2024
Cloud hardware emulation/virtual instrumentation	1	2019	4	2024
Third Party Intellectual Property (IP) and EDA tool repository development and demonstration	1	2019	4	2024
JFAC technical capability improvement development and demonstration	1	2019	4	2024
Microelectronics assurance and supply chain demonstrations	1	2019	4	2024
USG and industry engagement	1	2019	4	2024
Microelectronics assurance and supply chain policy and guidance development/update	1	2019	4	2024
Management/Technical Support	1	2019	4	2024

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 5					R-1 Program Element (Number/Name) PE 0605294D8Z / <i>Trusted and Assured Microelectronics</i>				Project (Number/Name) 822 / <i>Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) Enhancement and Demonstration</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
822: <i>Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) Enhancement and Demonstration</i>	-	0.000	80.861	159.651	-	159.651	41.734	41.790	41.740	42.992	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project supports the DoD microelectronics strategy by ensuring the availability of and access to the advanced, assured microelectronics that are critical for DoD and national security systems. It will support the development and delivery of tools to protect the intellectual property (IP) confidentiality and integrity for a broad range of systems and missions and will provide a path for the production of these articles. It will allow the DoD to 1) maintain technological leadership and a secure domestic microelectronics ecosystem; 2) promote access to all necessary current and future semiconductor technologies, including design, fabrication, packaging, and testing, from a robust base of suppliers; 3) provide multiple options for programs and the Defense Industrial Base to quickly upgrade microelectronic components; 4) 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 deliver new capabilities in artificial intelligence (AI) processors, co-development of advanced commercial-off-the-shelf (COTS) programmable devices, and addressing select IP obsolescence risks; and 5) 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 state-of-the-art (SOTA) technology; 2) enhancing state-of-the-practice (SOTP) foundries in the U.S. to produce more advanced technologies to better serve low-volume customers in the aerospace and defense community; 3) investing in research and development (R&D) for the next generation of microelectronics for new materials, devices, architectures, and designs in coordination with the Defense Advanced Research Projects Agency (DARPA) Electronics Resurgence Initiative (ERI); 4) promoting threat awareness, proactive protection, and supply chain security to ensure these investments continue to benefit the U.S.; and 5) exploring incentives for market growth through dual-use technologies, piloting acquisition reforms and providing incentives for cooperative R&D and trade.

MINSEC activities are categorized into the following focus areas: next generation disruptive R&D; capture and secure microelectronics R&D; new microelectronics development, demonstration, and capability insertion; COTS programmable integrated circuit (IC) co-development; microelectronics obsolescence and replacement; microelectronics-focused workforce development; radiation hardening by process (RHBP) and radiation hardening by design (RHBD); and radio frequency (RF) and optoelectronic (OE) microelectronics.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0605294D8Z / <i>Trusted and Assured Microelectronics</i>	Project (Number/Name) 822 / <i>Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) Enhancement and Demonstration</i>		
This project received additional funding in FY 2019 to support MINSEC efforts in the COTS programmable IC co-development focus area. FY 2020 funding for this project will continue the ongoing FY 2019 MINSEC COTS programmable IC co-development activities.				
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<p>Title: Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC)</p> <p>Description: This project’s activities will mature and evaluate microelectronics 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.</p> <p>FY 2019 Plans: This project will initiate and support MINSEC activities in the COTS programmable integrated circuit co-development technical focus area, to include a pilot program to secure design capabilities using commercially-available cloud-based services and supply chain tools with/at commercial co-development partners. These activities with key industry partners will support secure co-design efforts of their components’ security features and capabilities that are required to meet future DoD needs.</p> <p>FY 2020 Plans: This project will continue the following R&D activities in the COTS programmable IC co-development focus area:</p> <ul style="list-style-type: none">• Pilot secure co-design capabilities and supply chain tools using commercially-available cloud-based services with/at commercial co-development partners to secure commercial IP.• Develop and promote security features and software and hardware assurance tools and capabilities that meet future DoD needs.• Support proactive awareness and security of the microelectronics supply chain including supply chain intelligence/counterintelligence, crypto-provenance/tracking, informed authorities, and standards.• Stand up a small targeted team, co-led by DoD and the Office of the Director of National Intelligence, to define the full end-to-end supply chain issues and address critical security threats.• Leverage and enhance investments from local, state, federal government, and industry to develop domestic and agile high-mix, low-volume microelectronics manufacturing and packaging capabilities. <p>This project will engage early on with potential stakeholders to identify potential transition issues and aid in transition through joint collaboration between research teams and stakeholders with a focus on evaluations of prototypes, test articles, and beta versions of tools, IP, techniques, methods, etc. and their use in operationally-realistic scenarios.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Additional FY 2019 funding in the amount of \$40 million was added to support acceleration efforts for MINSEC COTS co-development activities. FY 2020 funding in the amount of \$118 million was added to support a high-mix, low-volume enhanced</p>		-	40.861	159.651

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0605294D8Z / <i>Trusted and Assured Microelectronics</i>	Project (Number/Name) 822 / <i>Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) Enhancement and Demonstration</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
microelectronics manufacturing domestic capability and a proactive awareness and security effort to identify and mitigate critical microelectronics supply chain threats.			
Accomplishments/Planned Programs Subtotals		-	40.861
		FY 2018	FY 2019
Congressional Add: Next Generation Microelectronics		-	40.000
FY 2019 Plans: • Enhance service lab design (demonstration hardware) and verification (formal verification, layout, etc.) expertise through on-site subject matter experts and engagement with commercial entities. • Evaluate specialized field programmable gate array designs from multiple commercial vendors for potential benefits and vulnerabilities.			
Congressional Adds Subtotals		-	40.000
C. Other Program Funding Summary (\$ in Millions)			
N/A			
Remarks			
D. Acquisition Strategy			
N/A			
E. Performance Metrics			
Performance for this project is monitored in the following ways:			
<ul style="list-style-type: none"> • Expanded access to leading SOTA technology and enhanced availability of essential SOTP design and fabrication capabilities. • Number of qualified SOTA IP and COTS programmable devices for DoD applications. • Test articles for JFAC verification and validation. • Number of secure design environment pilots/programs initiated. • Expanded library of assured IP and security features for DoD use. • Number of DoD and other USG programs employing assured access to SOTP and SOTA technologies, design approaches, and best practices developed in cooperation with commercial partners. 			

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0605294D8Z / <i>Trusted and Assured Microelectronics</i>	Project (Number/Name) 822 / <i>Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) Enhancement and Demonstration</i>
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Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) Innovation and Development	MIPR	DARPA, Air Force, Army, Navy, NSA : Various	-	-		80.861	Mar 2019	159.651	Mar 2020	-		159.651	Continuing	Continuing	-
Subtotal			-	-		80.861		159.651		-		159.651	Continuing	Continuing	N/A
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			-	-		80.861		159.651		-		159.651	Continuing	Continuing	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense																Date: February 2019			
Appropriation/Budget Activity 0400 / 5								R-1 Program Element (Number/Name) PE 0605294D8Z / <i>Trusted and Assured Microelectronics</i>								Project (Number/Name) 822 / <i>Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) Enhancement and Demonstration</i>			

	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
MINSEC Enhancement and Demonstration																												
COTS programmable integrated circuit co-development																												
Government and industry engagement																												
Microelectronics assurance and supply chain policy and guidance development/update																												
Management/Technical Support																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Office of the Secretary Of Defense			Date: February 2019
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0605294D8Z / <i>Trusted and Assured Microelectronics</i>	Project (Number/Name) 822 / <i>Microelectronics Innovation for National Security and Economic Competitiveness (MINSEC) Enhancement and Demonstration</i>	

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>MINSEC Enhancement and Demonstration</i>				
COTS programmable integrated circuit co-development	1	2019	4	2024
Government and industry engagement	1	2019	4	2024
Microelectronics assurance and supply chain policy and guidance development/update	1	2019	4	2024
Management/Technical Support	1	2019	4	2024

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity					R-1 Program Element (Number/Name)							
0400: Research, Development, Test & Evaluation, Defense-Wide / BA 5: System Development & Demonstration (SDD)					PE 0305304D8Z / DoD Enterprise Energy Information Management (EEIM)							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	17.185	4.032	2.429	4.373	-	4.373	4.157	3.306	3.371	3.436	Continuing	Continuing
304: Enterprise Energy Information Management	5.658	4.032	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
305: Real Property Accountability	9.841	0.000	1.379	3.052	-	3.052	2.836	1.985	2.050	2.087	Continuing	Continuing
306: DoD Siting Clearinghouse	1.686	0.000	0.250	0.349	-	0.349	0.349	0.349	0.349	0.356	Continuing	Continuing
307: Cyber Security	0.000	0.000	0.800	0.972	-	0.972	0.972	0.972	0.972	0.993	Continuing	Continuing

A. Mission Description and Budget Item Justification

PE 0305304D8Z was established in FY2013 and plays a pivotal role in the Department's ability to achieve audit readiness, enhance the Department's goal of energy efficiency, gain a full accountability of Real Property assets, as well as improve data quality and integration across the full spectrum of EI&E business functions. The PE helped conduct a full Business Process Re-engineering of the processes used to collect energy information, and publishing an EEIM data standard and an additional effort to build out data stores and portal requirements for Energy Conservation Investment Program (ECIP) management. Funding is also used to support ASD EI&E Senior Real Property Officer accountability requirements by supporting management and oversight of reconciliation efforts and auditability by determining requirements for the department's Real Property inventory records and asset management processes, business rules and associated data standards. A major component of this capability is an enterprise EI&E Data Analytics & Integration Support (DAIS) platform coupled with an independent verification & validation capability. With access to real time data through services WSDLS, reports generated through business intelligence provide immediate indicators driving improved and quicker decisions.

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	3.669	2.435	4.573	-	4.573
Current President's Budget	4.032	2.429	4.373	-	4.373
Total Adjustments	0.363	-0.006	-0.200	-	-0.200
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	0.370	-			
• SBIR/STTR Transfer	-	-			
• FFRDC	-0.007	-0.006	-	-	-
• A&S Reorganization realignment	-	-	-0.036	-	-0.036

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense				Date: February 2019			
Appropriation/Budget Activity			R-1 Program Element (Number/Name)				
0400: Research, Development, Test & Evaluation, Defense-Wide I BA 5: System Development & Demonstration (SDD)			PE 0305304D8Z I DoD Enterprise Energy Information Management (EEIM)				
• Biological and Chemical Threats Preparedness			-	-	-0.164	-	-0.164
Change Summary Explanation							
\$350K from Siting Clearinghouse O&M funds reprogrammed to EEIM RDT&E program line to fund Siting Clearinghouse RDT&E requirements.							

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 5					R-1 Program Element (Number/Name) PE 0305304D8Z / DoD Enterprise Energy Information Management (EEIM)				Project (Number/Name) 304 / Enterprise Energy Information Management			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
304: Enterprise Energy Information Management	5.658	4.032	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

A key part of DoD's strategy to meet its energy goals is to develop an energy information management environment that will enable the Services and OSD to track energy production and usage across the real property portfolio. Information on energy usage is critical for day-to-day management and accountability, troubleshooting building systems, and planning for capital investments. Integration with accurate Real property asset, Utilization, Military Construction, Environmental, and installation Geospatial data is equally key to ensuring these decisions for planning and reporting are possible. It also supports development of The geospatial portal for visualizing energy layers with other EI&E data on installation or area maps for improved spatial analysis. This portal is the DOD aggregated repository for DoD Common Installation Picture layers. Additionally, the map viewer is customized and easier for OSD senior staff to manipulate and includes an online catalog of maps, documents and data; and a secure, robust data exchange module. This development supports a range of Joint Staff and OSD customers. Since this effort is being accomplished through similar contract and vendors as PCode 305, funding was moved to 305 to facilitate simpler contract Purchase Request actions with fewer lines of accounting.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
Title: Enterprise Energy Information Management	4.032	0.000	0.000
Description: Supports development of an enterprise energy data store and associated standard that will be integrated with other existing and future data stores and visualization capability for a fully integrated and spatially analytical perspective of EI&E mission area information.			
FY 2019 Plans: Support Business Process Re-Engineering effort to update several EI&E business processes. These include updating the Enterprise Energy Information Model and related Business Enterprise Architecture, complete as is and to be process models for Armed Forces Pest Management Board enterprise business models, and Consolidated Safety Center Data model. This will also include updates in energy data store integrated into EI&E Data Analytics & Integration Support warehouse. Additional Data quality for DAIS is paramount to continue decision making for DoD Reform efforts.			
FY 2020 Plans: Support Business Process Re-Engineering effort to update several EI&E business processes. These include updating the Enterprise Energy Information Model and related Business Enterprise Architecture, complete as is and to be process models for Armed Forces Pest Management Board enterprise business models and Consolidated Safety Center Data model. This could potentially lead to a single enterprise system for his function. This will also include updates in energy data store integrated into EI&E Data Analytics & Integration Support warehouse. The standards and business rules will continue to be adjusted to ensure all			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0305304D8Z / DoD Enterprise Energy Information Management (EEIM)	Project (Number/Name) 304 / Enterprise Energy Information Management	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
DoD systems using or managing Real Property data is accurate and auditable. Additional Data quality for DAIS is paramount to continue decision making for DoD Reform efforts and other transitional process improvements.			
FY 2019 to FY 2020 Increase/Decrease Statement: Allocation to the BEA and modeling activities decreased due to decrease in PE funding driven by DCMO enforced SRRB efficiency drill.			
Accomplishments/Planned Programs Subtotals		4.032	0.000
C. Other Program Funding Summary (\$ in Millions) N/A			
Remarks			
D. Acquisition Strategy EI&E BSI solicits for contracted support through WHS contracting office based on a PWS built on functional requirements and a funding profile based on government estimates derived from those requirements.			
E. Performance Metrics Performance is measured against cost, deliverable quality and scheduled based on the deliverable schedule and performance measures built into the contract and monitored by the COR and WHS contracting office.			

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0305304D8Z / DoD Enterprise Energy Information Management (EEIM)	Project (Number/Name) 304 / Enterprise Energy Information Management
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Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
EI&E Data Analytics & Integration Support (DAIS) Platform	Option/ FFP	Favor Tech Consulting LLC : Richmond VA	4.370	0.390	Sep 2015	-		-		-		-	Continuing	Continuing	-
DISI Portal	MIPR	USACE : CRREL	1.288	0.102	Jul 2016	-		-		-		-	Continuing	Continuing	-
EI&E Data Analytics & Integration Support (DAIS) Platform (FY19 re-compete)	C/FFP	TBD : TBD	-	0.700	Mar 2019	-		-		-		-	Continuing	Continuing	-
DISDI Portal (FY19)	MIPR	USACE CRREL : 72 Lyme Road, Hanover, NH 03755	-	0.234	Jan 2019	-		-		-		-	Continuing	Continuing	-
Subtotal			5.658	1.426		-		-		-		-	Continuing	Continuing	N/A

Remarks

The data from this system supports DoD Reform Initiatives. System and data maintained by this project in FY19 will be provided with funding from project 305. Additionally, Less service was procured in FY18 to allow hold back of some FY18 RDT&E to apply to these requirements in first quarter FY19. Issue should be resolved when adequate funding returns FY20.

Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Platform Resilience Mission Assurance (PRMA)	MIPR	ARMAMENT RDEC : BLDG 91 4TH AVE, PICATINNY ARSENAL NJ 07806-5000	-	0.954	Jan 2018	-		-		-		-	Continuing	Continuing	-
BSI Technical Support	Option/ LH	Ian, Evans and Alexander Corp : 20098 ASHBROOK PL, SUITE 260, Ashburn VA 20147	-	1.652	Apr 2016	-		-		-		-	Continuing	Continuing	-
Subtotal			-	2.606		-		-		-		-	Continuing	Continuing	N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense										Date: February 2019						
Appropriation/Budget Activity 0400 / 5					R-1 Program Element (Number/Name) PE 0305304D8Z / DoD Enterprise Energy Information Management (EEIM)					Project (Number/Name) 304 / Enterprise Energy Information Management						
				Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals				5.658	4.032		0.000		-		-		-	Continuing	Continuing	N/A
Remarks NA																

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0305304D8Z / DoD Enterprise Energy Information Management (EEIM)	Project (Number/Name) 304 / Enterprise Energy Information Management
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ID	Task Name	Start	Finish	2018				2019				2020			
				Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4
2	Develop ESS DISDI Shell	07/30/18	02/30/2019												
3	Complete Voyager Programmin	01/01/19	07/29/19												
4	Update DAIS to RPIM 10	04/15/18	03/30/19												
4	Complete DAIS ERCIP Sprint	07/01/18	03/30/19												
	Complete Complete new WSDL	09/20/18	04/16/19												
	FY19 PRMA Evaluations	01/01/19	09/30/19												
	Develop FY-20 Program	03/01/19	02/28/20												
3	FY20 PRMA Evaluations	01/01/20	09/30/20												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0305304D8Z / DoD Enterprise Energy Information Management (EEIM)	Project (Number/Name) 304 / Enterprise Energy Information Management
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Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>DISDI Portal Development</i>				
Develop ESS DISDI Shell	4	2018	2	2019
Complete Voyager Programming	2	2019	4	2019
<i>DAIS Development</i>				
Update to RPIM 10 daa standards and Business Rules	3	2018	4	2019
Complete DAIS ERCIP Sprint	4	2018	2	2019
Complete new single WSDL	4	2018	3	2019
<i>DoD Facility Related Controls Cyber Security Risk Assessment</i>				
FY19 PRMA Evaluations	2	2019	2	2020
Develop FY20 Program	2	2019	4	2019
FY20 PRMA Evaluations	2	2020	4	2020

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
305: Real Property Accountability	9.841	0.000	1.379	3.052	-	3.052	2.836	1.985	2.050	2.087	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Real Property Inventory fulfills requirements of Executive Order for DoD to achieve and maintain real property accountability. This is critical both from audit readiness and program management perspectives. This funding provides the department independent verification and validation needed to reconcile errors to gain the data quality and interoperability needed for decisionable data and processes throughout the lifecycle of real property assets. Oversight and configuration management of business rules and standards are used to determine requirements for the departments Real Property inventory records and proper end to end process steps throughout the lifecycle of an asset from purchase to disposal. This includes development and procurement of the enterprise data warehouse for integrating existing and future EI&E systems and database needs. The Real Property Unique Identifier (RPUID) process has also been included in this EI&E enterprise system.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
Title: Real Property Accountability	0.000	1.379	3.052
Description: The ASD EI&E is the Senior Real Property Officer for the DoD. In this role they are responsible for the accountability and utilization of all DoD Real Property Assets. This funding provides the department a enterprise data warehouse coupled with a independent verification & validation capability. The DoD Real Property Accountability efforts are mandated by Executive Order and Public Law for improved reporting and utilization of federal real property and verifiable decisionable data is needed for future BRAC deliberations.			
FY 2019 Plans: Continue reconciliation and auditability efforts by determining requirements for the department's Real Property inventory records and asset accountability and management processes, business rules and associated data. Continue DAIS implementation with WSDL maturity and improved data quality and integration in preparation for BRAC and other upcoming analysis and decisions.			
FY 2020 Plans: Continue reconciliation and auditability efforts by determining requirements for the department's Real Property inventory records and asset accountability and management processes, business rules and associated data. Continue DAIS implementation with WSDL maturity and improved data quality and integration in preparation for BRAC and other upcoming analysis and decisions.			
FY 2019 to FY 2020 Increase/Decrease Statement: Decrease due to Comptroller's budget decision INV-001 which rephrases funding from FY19 to 20-21.			
Accomplishments/Planned Programs Subtotals	0.000	1.379	3.052

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0305304D8Z / <i>DoD Enterprise Energy Information Management (EEIM)</i>	Project (Number/Name) 305 / <i>Real Property Accountability</i>
<p><u>C. Other Program Funding Summary (\$ in Millions)</u> N/A</p> <p><u>Remarks</u></p> <p><u>D. Acquisition Strategy</u> EI&E BSI solicits for contracted support through WHS contracting office based on a PWS built on functional requirements and a funding profile based on government estimates derived from those requirements</p> <p><u>E. Performance Metrics</u> Performance is measured against cost, deliverable quality and scheduled based on the deliverable schedule and performance measures built into the contract and monitored by the COR and WHS contracting office.</p>		

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense												Date: February 2019					
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)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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		
EI&E Data Analytics & Integration Platform	C/FFP	TBD : TBD	0.788	-		-		0.636	Mar 2020	-		0.636	Continuing	Continuing	-		
Subtotal			0.788	-		-		0.636		-		0.636	Continuing	Continuing	N/A		
Remarks NA																	
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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		
BSI Support Contract	C/FFP	TBD : TBD	8.310	-		1.379	Apr 2019	2.100	Apr 2020	-		2.100	Continuing	Continuing	-		
DISDI IGI&S Portal	MIPR	USACE : CRREL	0.743	-		0.000		0.316		-		0.316	Continuing	Continuing	-		
Subtotal			9.053	-		1.379		2.416		-		2.416	Continuing	Continuing	N/A		
Remarks NA																	
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract		
Project Cost Totals			9.841	-		1.379		3.052		-		3.052	Continuing	Continuing	N/A		
Remarks NA																	

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense			Date: February 2019
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	2018				2019				2020			
				Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4
1	EI&E DBS PFM Reviews	10/01/18	continuous												
2	Develop FY-19 BEA Artifacts	01/01/18	09/30/19												
3	RPIM Updates	11/01/18	11/30/20												
4	EI&E BPR	10/01/18	03/20/20												
5	IV&V	10/01/18	continuous												
6	EI&E Processes Auditability	10/01/18	09/30/19												
7	EI&E Data Analytics & Integration	10/01/19	09/30/20												
8	DISDI IGI&S Portal	10/01/19	09/30/20												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

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
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Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>PfM</i>				
EI&E DBS PfM Reviews	1	2018	4	2020
Develop BEA Artifacts	2	2018	4	2019
<i>Real Property Asset Management</i>				
RPIM Updates	1	2018	1	2020
EI&E BPR	4	2018	2	2020
IV&V	1	2018	4	2020
EI&E Process & SYstem Auditability	4	2018	4	2019
EI&E Data Analytics & Integration	1	2019	4	2020
DISDI IGI&S Portal	1	2019	4	2020

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
306: DoD Siting Clearinghouse	1.686	0.000	0.250	0.349	-	0.349	0.349	0.349	0.349	0.356	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification
 The DoD Siting Clearinghouse is charged with the identification of technical mitigation measures necessary to overcome degradation of radar from the proliferation of industrial wind turbine development. This R&D is necessary to work with FFRDCs to study potential technical improvements to radar.

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
Title: DoD Siting Clearinghouse Description: The DoD Siting Clearinghouse is charged with the identification of technical mitigation measures necessary to overcome degradation of radar from the proliferation of industrial wind turbine development. This R&D is necessary to work with FFRDCs to study potential technical improvements to radar. FY 2019 Plans: Continue to support radar studies as planned through the Wind Turbine Interference Mitigation Forum. FY 2020 Plans: Continue to support radar studies as planned through the Wind Turbine Interference Mitigation Forum. FY 2019 to FY 2020 Increase/Decrease Statement: Note: P-Code 306 formerly had Cyber Security which is now shown in P-307 (thus no decrease). New requirement for RDT&E funding, not previously programmed for Siting Clearinghouse.	0.000	0.250	0.349
Accomplishments/Planned Programs Subtotals	0.000	0.250	0.349

C. Other Program Funding Summary (\$ in Millions)
 N/A
Remarks

D. Acquisition Strategy
 There is not an existing contract for this, as FY19 is the first year for Clearinghouse R&D Funding. The Clearinghouse will work this through existing efforts with FFRDCs.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0305304D8Z / <i>DoD Enterprise Energy Information Management (EEIM)</i>	Project (Number/Name) 306 / <i>DoD Siting Clearinghouse</i>

E. Performance Metrics

The DoD Siting Clearinghouse monitors study progress through bi-weekly WTRI teleconferences supported by written bi-weekly project updates.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense												Date: February 2019			
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)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Coordinate Tech Studis of to overcome Impacts to Radar	FFRDC	TBD : TBD	1.686	-		0.250	Jan 2019	0.349	Jan 2020	-		0.349	-	-	-
Subtotal			1.686	-		0.250		0.349		-		0.349	-	-	N/A

Remarks NA															
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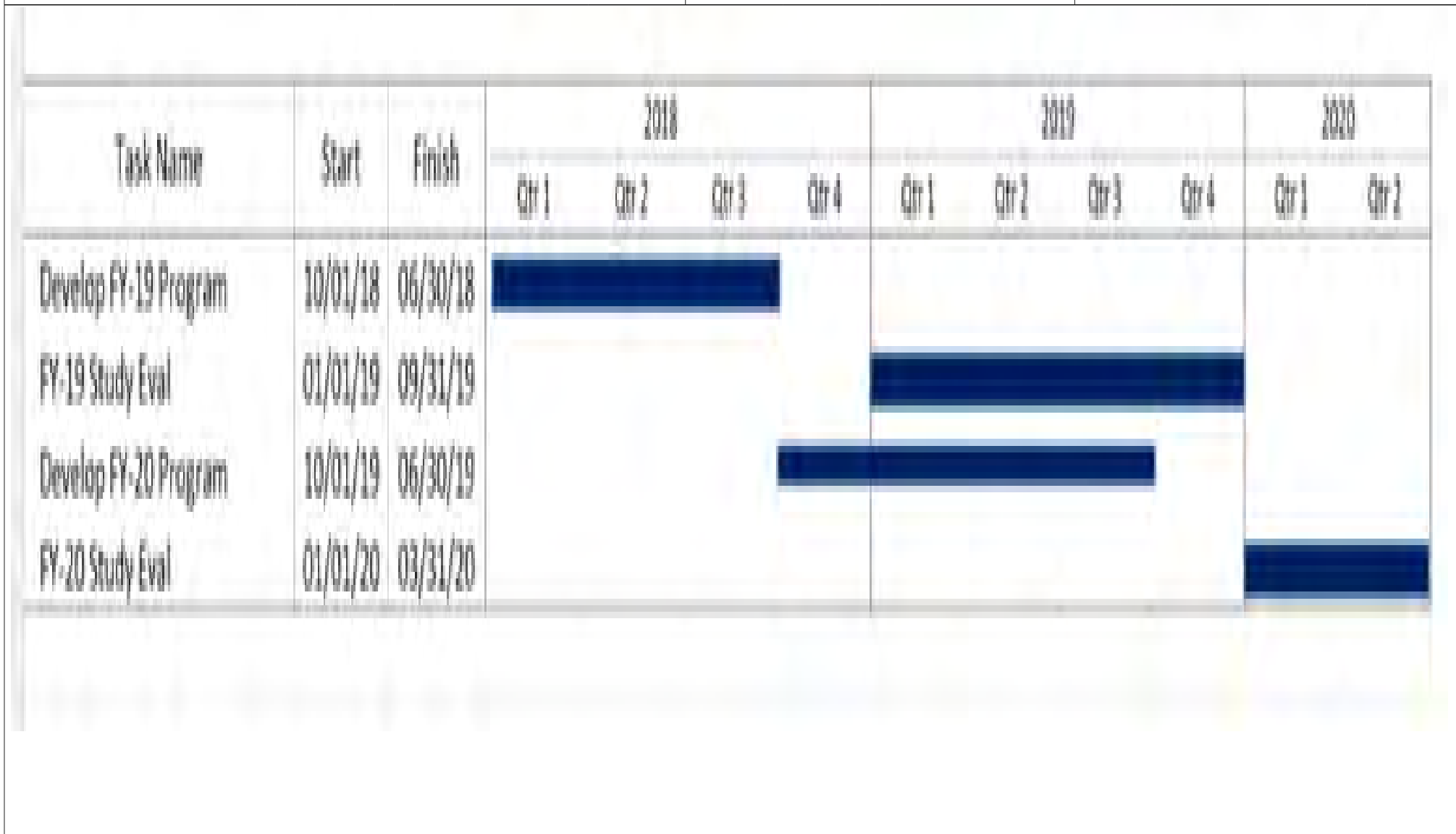
	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	1.686	-		0.250		0.349		-		0.349	-	-	N/A

Remarks NA															
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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

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
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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Office of the Secretary Of Defense			Date: February 2019
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

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>DoD Siting Clearinghouse</i>				
Develop FY19 Program	1	2018	3	2018
FY19 Study Eval	1	2019	4	2019
Develop FY20 Program	1	2019	3	2019
FY Study Eval	1	2020	2	2020

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
307: Cyber Security	0.000	0.000	0.800	0.972	-	0.972	0.972	0.972	0.972	0.993	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The current state of cyber security of energy-related (and other real property-related) control systems (such as the electronic/computer controls on heating, ventilation & air conditioning equipment) is deficient, and the adjusted EEIM baseline supports a multi-year real property-related control systems cyber security initiative to address these issues.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
Title: Cyber Security	0.000	0.800	0.972
<p>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.)</p> <p>Controls systems cyber security Tactics, Techniques and Procedures (TTPS) has transitioned from Joint Base Architecture for Secure Industrial Control Systems (J-BASICS). The department has begun to implement Platform Resilience Mission Assurance (PRMA) assessments across 10 installations.</p> <p>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.</p> <p>FY 2019 Plans:</p> <p>Continue to support multiyear real property-related controls systems cyber security risk assessments and development of guidelines and training manuals for future in house procedures. finalize DoD actions supporting the joint initiative with DOE this year.</p> <p>FY 2020 Plans:</p> <p>Continue to support multiyear real property-related controls systems cyber security risk assessments and development of guidelines and training manuals for future in house procedures. finalize DoD actions supporting the joint initiative with DOE this year.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement:</p>			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
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 2018	FY 2019
<p>Note: Cyber Security funding moved from P-Code 306 to P-Code 307. Decrease due to budget decision which rephases 19 funds to FY20-21. Fund at highest level possible since it is CYBERCOM funding provided for specific Cyber Security risks assessments and mitigation actions for facility related controls systems managed in the EI&E business line.</p> <p>Decrease in budget will significantly impact ability of program to meet its stated goal. At current levels of funding, up to half of installations scheduled and coordinated to be evaluated under the PRMA program will be canceled. There will not be enough data collected to complete FY18 and beyond goals for the establishment of department and enterprise wide cybersecurity solutions and methodologies.</p>			
Accomplishments/Planned Programs Subtotals		0.000	0.800
C. Other Program Funding Summary (\$ in Millions)			
N/A			
Remarks			
D. Acquisition Strategy			
N/A			
E. Performance Metrics			
NA			

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense												Date: February 2019			
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			
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
PRMAPlatform Resilience Mission Assurance (PRMA)	MIPR	ARMAMENT RDEC : BLDG 91 4TH AVE, PICATINNY ARSENAL NJ 07806-5000	-	-		0.800	Jan 2019	0.972		-		0.972	Continuing	Continuing	-
Subtotal			-	-		0.800		0.972		-		0.972	Continuing	Continuing	N/A
Remarks Funding for this project was provided out of PCode304 in FY18.															
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			-	-		0.800		0.972		-		0.972	Continuing	Continuing	N/A
Remarks NA															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense		Date: February 2019
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

ID	Task Name	Start	Finish	2018				2019				2020			
				Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4
2	FY19 PRMA Evaluations	01/01/19	09/30/19												
3	Develop FY-20 Program	03/01/19	02/28/20												
4	FY20 PRMA Evaluations	01/01/20	09/30/20												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Office of the Secretary Of Defense			Date: February 2019
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0305304D8Z / <i>DoD Enterprise Energy Information Management (EEIM)</i>	Project (Number/Name) 307 / <i>Cyber Security</i>	

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>DoD Facility Related Controls Cyber Security Risk Assessment</i>				
FY19 PRMA Evaluations	2	2019	2	2020
Develop FY20 Program	2	2019	4	2019
FY20 PRMA Evaluations	2	2020	4	2020

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity					R-1 Program Element (Number/Name)							
0400: Research, Development, Test & Evaluation, Defense-Wide / BA 5: System Development & Demonstration (SDD)					PE 0305310D8Z / CWMD Systems: System Development & Demonstration							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	0.000	8.214	17.009	12.854	-	12.854	13.320	14.558	15.475	15.631	Continuing	Continuing
813: System Development & Demonstration	0.000	8.214	17.009	12.854	-	12.854	13.320	14.558	15.475	15.631	Continuing	Continuing

Note

Increase from FY 2018 to FY2019 the result of reallocation of resources across the portfolio to better support the full RDT&E cycle and technology insertions. Reduction from FY2019 to FY2020 the result of further reallocation of resources to gain efficiencies following the elimination of BA-6 / PE#0306310D8Z and combination of O&M projects CWMD Sustainment with Threat Reduction and Arms Control.

A. Mission Description and Budget Item Justification

The Countering Weapons of Mass Destruction (CWMD) Systems program provides funding for research, development, integration, and deployment of CWMD capabilities. Funding is allocated to a portfolio of projects and activities in response to Combatant Command, joint, and Military Service capability needs and research initiatives. The CWMD Systems program supports 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 program is organized to develop, enhance, mature and transition technologies across the RDT&E continuum, from Advanced Technology Development through Operational Systems Development, as well as limited sustainment in unique cases. A focus area is investment in CWMD-related technologies that require additional development to transition to fielded capabilities, in response to validated, prioritized requirements. This effort fills a seam in which capability gaps are not being addressed adequately or sufficiently to meet warfighter needs. The CWMD Systems program closes gaps identified by specialized military units and leverages prior S&T investments to continue development and fielding of operational systems to those units.

The program's legacy focus on CWMD situational awareness capabilities remains a significant component of the investment portfolio. U.S. Special Operations Command, which assumed CWMD mission responsibilities in January 2017 per the Unified Command Plan, is providing focus and guidance for development of CWMD situational awareness capabilities. The CWMD Systems program funds initiatives to close CWMD situational awareness gaps by leveraging mature technologies, modifying existing systems, and utilizing technology-enabled analytical cells to provide support to Combatant Commands and other joint and Service commands. These cells curate, synthesize, and contextualize CWMD information for end-users. This hybrid approach facilitates cross-organizational information sharing and collaboration, necessary for addressing the trans regional character of WMD proliferation.

During FY 2018 and FY 2019 the CWMD Systems program utilized four Research, Development, Test & Evaluation (RDT&E) program elements (BA-3 / PE#0303310D8Z, BA-5 / PE#0305310D8Z, BA-6 / PE#0306310D8Z, and BA-7 / PE#0607310D8Z), as well as an Operations and Maintenance (O&M) "CWMD Sustainment" line (PE#0901388D8Z ORC-2531). Reallocation of resources beginning in FY 2020 will eliminate the BA-6 / PE#0306310D8Z program element and address O&M requirements with the "Threat Reduction and Arms Control" line (PE#0901388D8Z ORC-3501).

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 5: System Development & Demonstration (SDD)</i>	R-1 Program Element (Number/Name) PE 0305310D8Z / <i>CWMD Systems: System Development & Demonstration</i>
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This Program Element (PE) funds engineering and manufacturing development of CWMD systems, components, technologies, and/or applications, including system development and demonstration, and initial operational test and evaluation. The purpose is to develop, build, and test systems, verify that all operational and derived requirements have been met, and support product development decisions.

This appropriation funds travel to support the requirements of this program, and 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, development and test and evaluation efforts.

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	8.230	17.048	17.887	-	17.887
Current President's Budget	8.214	17.009	12.854	-	12.854
Total Adjustments	-0.016	-0.039	-5.033	-	-5.033
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• FFRDC reduction	-0.016	-0.039	-	-	-
• Reallocation to other CWMD Systems PE's	-	-	-4.551	-	-4.551
• Program Adjustment	-	-	-0.482	-	-0.482

Change Summary Explanation

Increase from FY 2018 to FY2019 the result of reallocation of resources across the portfolio in POM-19 to better support the full RDT&E cycle and technology insertions. Reduction from FY2019 to FY2020 the result of further reallocation of resources to gain efficiencies following the elimination of BA-6 / PE#0306310D8Z and combination of O&M projects CWMD Sustainment with Threat Reduction and Arms Control.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 5					R-1 Program Element (Number/Name) PE 0305310D8Z / CWMD Systems: System Development & Demonstration				Project (Number/Name) 813 / System Development & Demonstration			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
813: System Development & Demonstration	0.000	8.214	17.009	12.854	-	12.854	13.320	14.558	15.475	15.631	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Countering Weapons of Mass Destruction (CWMD) Systems program provides funding for research, development, integration, and deployment of CWMD capabilities. Funding is allocated to a portfolio of projects and activities in response to Combatant Command, joint, and Military Service capability needs and research initiatives.

The CWMD Systems program is organized to develop, enhance, mature and transition technologies across the RDT&E continuum, from Advanced Technology Development through Operational Systems Development, as well as limited sustainment in unique cases. A focus area is investment in CWMD-related technologies that require additional development to transition to fielded capabilities, in response to validated, prioritized requirements. This effort fills a seam in which capability gaps are not being addressed adequately or sufficiently to meet warfighter needs. The CWMD Systems program closes gaps identified by specialized military units and leverages prior S&T investments to continue development and fielding of operational systems to those units.

The program's legacy focus on CWMD situational awareness capabilities remains a significant component of the investment portfolio. U.S. Special Operations Command, which assumed CWMD mission responsibilities in January 2017 per the Unified Command Plan, is providing focus and guidance for development of CWMD situational awareness capabilities. The CWMD Systems program funds initiatives to close CWMD situational awareness gaps by leveraging mature technologies, modifying existing systems, and utilizing technology-enabled analytical cells to provide support to Combatant Commands and other joint and Service commands. These cells curate, synthesize, and contextualize CWMD information for end-users. This hybrid approach facilitates cross-organizational information sharing and collaboration, necessary for addressing the trans regional character of WMD proliferation.

During FY 2018 and FY 2019 the CWMD Systems program utilized four Research, Development, Test & Evaluation (RDT&E) program elements (BA-3 / PE#0303310D8Z, BA-5 / PE#0305310D8Z, BA-6 / PE#0306310D8Z, and BA-7 / PE#0607310D8Z), as well as an Operations and Maintenance (O&M) "CWMD Sustainment" line (PE#0901388D8Z ORC-2531). Reallocation of resources beginning in FY 2020 will eliminate the BA-6 / PE#0306310D8Z program element and address O&M requirements with the "Threat Reduction and Arms Control" line (PE#0901388D8Z ORC-3501).

This project funds engineering and manufacturing development of CWMD systems, components, technologies, and/or applications, including system development and demonstration, and initial operational test and evaluation. The purpose is to develop, build, and test systems, verify that all operational and derived requirements have been met, and support product development decisions.

This appropriation funds travel to support the requirements of this program, and 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, development and test and evaluation efforts.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0305310D8Z / CWMD Systems: System Development & Demonstration	Project (Number/Name) 813 / System Development & Demonstration	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
Title: P*813 / System Development & Demonstration Description: • Perform engineering and manufacturing development of CWMD systems, components, technologies, and/or applications • Perform system development and demonstration and initial operational test and evaluation • Provide support to program management office on product development decisions FY 2019 Plans: • Perform engineering and manufacturing development of CWMD systems and components in support of capability needs of specialized military units • Perform system development and demonstration and initial operational test and evaluation of CWMD systems and components • Provide support to program management office on product development decisions FY 2020 Plans: • Perform engineering and manufacturing development of CWMD systems and components in support of capability needs of specialized military units • Perform system development and demonstration and initial operational test and evaluation of CWMD systems and components • Provide support to program management office on product development decisions FY 2019 to FY 2020 Increase/Decrease Statement: Reduction from FY2019 to FY2020 the result of reallocation of resources to gain efficiencies following the elimination of BA-6 / PE#0306310D8Z and combination of O&M projects CWMD Sustainment with Threat Reduction and Arms Control.		8.214	17.009
Accomplishments/Planned Programs Subtotals		8.214	12.854
C. Other Program Funding Summary (\$ in Millions)			
N/A			
Remarks			
D. Acquisition Strategy			
Utilize or reuse information technologies to field initial capabilities to end-users. As technologies mature and user needs are refined, systems or applications may transition to acquisition program(s) or be sustained separately. Integration of or interoperability among systems is also an acquisition pathway.			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0305310D8Z / CWMD Systems: System Development & Demonstration	Project (Number/Name) 813 / System Development & Demonstration

E. Performance Metrics

Success in this area is measured by compliance with various statutes and DoD directives that govern the conduct of the affairs within the Office of the Assistant Secretary of Defense for Nuclear, Chemical and Biological Defense Programs (OASD/NCB). Maintain cost, schedule, and performance reporting, review, and adjudication. Maintain requirements traceability matrix.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense												Date: February 2019			
Appropriation/Budget Activity 0400 / 5						R-1 Program Element (Number/Name) PE 0305310D8Z / CWMD Systems: System Development & Demonstration					Project (Number/Name) 813 / System Development & Demonstration				
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Engineering & manufacturing development of information systems & components	C/T&M	TBD : TBD	0.000	4.107	Jan 2018	8.504	Jan 2020	6.427		-		6.427	Continuing	Continuing	-
Systems development & demonstration, and initial operational test & evaluation	C/T&M	TBD : TBD	0.000	3.286	Jan 2018	6.804	Jan 2020	5.142		-		5.142	Continuing	Continuing	-
Program management support	C/T&M	TBD : TBD	0.000	0.821	Jan 2018	1.701	Jan 2020	1.285		-		1.285	Continuing	Continuing	-
Subtotal			0.000	8.214		17.009		12.854		-		12.854	Continuing	Continuing	N/A
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			0.000	8.214		17.009		12.854		-		12.854	Continuing	Continuing	N/A
Remarks NA															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense			Date: February 2019		
Appropriation/Budget Activity 0400 / 5			R-1 Program Element (Number/Name) PE 0305310D8Z / CWMD Systems: System Development & Demonstration		
			Project (Number/Name) 813 / System Development & Demonstration		

**CWMD Systems: System Development and Demonstration (SDD)
BA 5 / PE 0305310D8Z**

FY17				FY18				FY19				FY20				FY21				FY22				FY23			
Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
													</														

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Office of the Secretary Of Defense			Date: February 2019
Appropriation/Budget Activity 0400 / 5	R-1 Program Element (Number/Name) PE 0305310D8Z / CWMD Systems: System Development & Demonstration	Project (Number/Name) 813 / System Development & Demonstration	

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>Engineering & Manufacturing Development</i>				
Develop information systems & components	2	2018	4	2023
<i>Operational Test & Evaluation</i>				
Perform initial operational T&E	2	2018	4	2023
<i>Program Management Support</i>				
Provide PM support for development and T&E	2	2018	4	2023

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	34.614	6.941	6.607	9.724	-	9.724	9.793	9.858	9.925	9.925	Continuing	Continuing
774: Defense Readiness Reporting System (DRRS)	34.614	6.941	6.607	9.724	-	9.724	9.793	9.858	9.925	9.925	Continuing	Continuing

A. Mission Description and Budget Item Justification

This funding supports the Defense Readiness Reporting System - Strategic, (DRRS-S,) the comprehensive readiness reporting system for the Department of Defense mandated under Title 10 U.S. Code. The system measures in an objective, accurate, and timely manner the capability of the armed forces to carry out the National Security Strategy prescribed by the President, as well as the defense planning guidance provided by the Secretary of Defense and the National Military Strategy prescribed by the Chairman of the Joint Chiefs of Staff. DRRS-S hosts information and applications used to support the Geographic and Functional Combatant Commanders, the Services, Combat Support Agencies, the Joint Staff and the Office of the Secretary of Defense.

The transformation of readiness reporting into a new, more comprehensive system under DRRS, presents a number of significant 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 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 allows the Department to assess readiness globally based on our 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. The need for these applications and the underlying data are a top priority for the DRRS project.

Consistent with Congressional guidance, the service-specific readiness systems are being integrated within DRRS-S while the system is undergoing further reform to better portray the Departments' ability to meet the National Defense Strategy and fully implement the highly complex data structures and visualization tools needed to support the Global Force Management - Data Initiative, critical to the consumers of readiness information.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 6:</i> <i>RDT&E Management Support</i>	R-1 Program Element (Number/Name) PE 0604774D8Z I <i>Defense Readiness Reporting System (DRRS)</i>
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B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	6.941	6.661	6.724	-	6.724
Current President's Budget	6.941	6.607	9.724	-	9.724
Total Adjustments	0.000	-0.054	3.000	-	3.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• FFRDC	-	-0.054	-	-	-
• DRRS Consolidation	-	-	3.000	-	3.000

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
774: Defense Readiness Reporting System (DRRS)	34.614	6.941	6.607	9.724	-	9.724	9.793	9.858	9.925	9.925	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This funding supports Defense Planning Guidance (DPG) directing the Department of Defense (DoD) components to develop guidelines and procedures for a comprehensive readiness reporting system that evaluates readiness on the basis of the actual missions and capabilities assigned to the forces. The Defense Readiness Reporting System (DRRS) establishes a capabilities-based, adaptive, near real-time readiness information system for the DoD. This system is being designed to measure the readiness of military forces and supporting infrastructure to meet missions and goals assigned by the Secretary of Defense. DRRS 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 expands the scope of readiness reporting within the Department to create a more comprehensive assessment of the total force and its capability to perform the tasks and missions required of it to support the National Military Strategy. DRRS allows the Department to assess readiness globally based on our integrated ability to project and sustain a mix of constructed forces in simultaneous engagements. The program is the keystone for the readiness enterprise and architected to embrace the implementation of the Global Force Management - Data Initiative (GFM-DI), allowing for the Department's efforts in the realm of Adaptive Planning and Execution to be fully supported.

The realization of DRRS requires integrating a host of key technologies in order to achieve an information system that supports distributed, collaborative, and dynamic readiness reporting in addition to continuous tool-based assessment. The primary technical goal is the creation of a highly reliable and securely integrated readiness data environment to leverage and extend current readiness information systems. This system is based on intelligent agents, dynamic databases, semantic middleware, and publish/subscribe concepts; providing a logically uniform view into the multiple databases and information sources that feed DRRS. Through this type of advanced information environment, the DRRS dramatically expands the range of readiness information available to manage the force. This environment supports a suite of analysis tools that allow users to explore the consequences of readiness deficiencies in terms of the ability to generate forces and assess transportation feasibility as it pertains to specific scenarios. These tools and tool suites harness the power of the information environment to make possible the kind of quick-turnaround, excursion-driven readiness assessment that is at the heart of DRRS.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
Title: 774 Defense Readiness Reporting System	6.941	6.607	9.724
Description: DRRS is the primary means by which Defense components (Combatant Commands, Services, Agencies and their subordinate elements and units) report their readiness. The system measures readiness of the Department's components to execute the full range of missions assigned by the Secretary of Defense.			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0604774D8Z / <i>Defense Readiness Reporting System (DRRS)</i>	Project (Number/Name) 774 / <i>Defense Readiness Reporting System (DRRS)</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>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 readiness data environment to leverage and extend current readiness information systems. DRRS contains readiness metrics and supporting data for forces and support organizations.</p> <p>FY 2019 Plans:</p> <ul style="list-style-type: none"> • Continue replacement of vulnerable & legacy software components • Optimize program architecture to make use of hosting technology advancements • Incorporate functionality enhancements required by evolving readiness reporting needs • GFM DI "next steps" development • Air Force Input Tool Enhancements <p>FY 2020 Plans:</p> <ul style="list-style-type: none"> • Implement functionality necessary to support the Army, Navy, and Marine Corps' direct input of readiness information into DRRS-S, facilitating the Services' transition and the retirement of service-specific DRRS versions. • 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 <p>FY 2019 to FY 2020 Increase/Decrease Statement:</p> <p>The program's increased costs stem from the greater level of developmental activities required during FY 2020. These activities include the incorporation of functionality required by the Services to enable the retirement of service-specific DRRS variants, as well as improvements to better gauge readiness relative to the National Defense Strategy.</p>			
Accomplishments/Planned Programs Subtotals		6.941	6.607
C. Other Program Funding Summary (\$ in Millions)			
N/A			
Remarks			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
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)
D. Acquisition Strategy N/A		
E. Performance Metrics <ul style="list-style-type: none">• Readiness Transformation - Accurate and timely Mission Readiness Assessment and Reporting• Capability Readiness Reporting and Assessment - Operational commonality of mission based capability readiness reporting and assessment• DRRS Operational Performance - Single integrated Readiness system capability for the Department• Achieving Reliable Data Architecture and Interoperability - Seamless integration with the departments readiness architecture and compatible with emerging adaptive planning systems• Transition to one readiness reporting system for DoD.		

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity	R-1 Program Element (Number/Name)											
0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 6: RDT&E Management Support</i>	PE 0604875D8Z I <i>Joint Systems Architecture Development</i>											
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	19.102	4.695	4.079	9.593	0.000	9.593	9.778	9.675	9.368	9.614	Continuing	Continuing
875: <i>Portfolio Systems Acquisition (PSA)</i>	18.808	0.000	2.679	4.092	0.000	4.092	4.413	4.672	4.257	4.398	Continuing	Continuing
220: <i>Electronic Warfare Executive Committee</i>	0.294	4.695	1.400	5.501	0.000	5.501	5.365	5.003	5.111	5.216	Continuing	Continuing

Note

The FY2019 funding request was reduced by \$0.006 million to account for the availability of prior year execution balances. In FY2020, the increase (approximately \$4M) in JSAD funds is due to new and expanded mission areas and requirements in the Assistant Secretary of Defense for Acquisition (ASD(A) portfolio as a result of the USD A&S reorganization. These funds will support the Electronic Warfare Executive Committee recommended projects on Electronic Battle Management (EBM), and the development of a comprehensive electronic warfare strategy to identify gaps and requirements across the Department. The funds will include support to the mission engineering analyses and integration to incorporate soft kill and Electronic Warfare effects, and weapon systems in critical mission thread areas in order to meet evolving threats.

A. Mission Description and Budget Item Justification

Department and acquisition reform initiatives call for top down, national security strategy-driven capabilities-based planning. Department of Defense (DoD) Instruction 5000.02 and Chairman of the Joint Chiefs of Staff Instruction 3170.01 promulgate capabilities-based requirements and acquisition processes. The JSAD program enables collaborative efforts to achieve these goals with a focus on Major Defense Acquisition Programs (MDAPs). These efforts include warfighting capability-based analyses; assessments of joint capability areas and joint integrating concepts; development of system-related data; integrated roadmaps to support acquisition investment decisions; and assessments of MDAPs in a capability area context. Activities in the JSAD project are divided into three areas: (1) capability-based analysis; (2) roadmaps; and (3) support tools and guidance. Capability-based analysis provides analysis of the different technology, functionality, and integration impacts of systems on warfighting capability. Acquisition roadmaps guide systems development and associated investment plans. JSAD support tools and guidance initiatives develop systems data, and tools, exploit modeling and simulation and architecture efforts to improve DoD's overall assessment capability. These efforts guide the development and improve the testing and fielding of integrated systems of systems in order to achieve Joint mission capabilities. The Department has also undergone an institutional reorientation or shift in emphasis from organization-specific to enterprise-wide approaches. This means: (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 direction, 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 QDR direction outlined above in order to achieve portfolio systems acquisition goals. The program is broken up into two focus areas (Portfolio Management and Reform Initiatives).

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 6:</i> <i>RDT&E Management Support</i>	R-1 Program Element (Number/Name) PE 0604875D8Z <i>I Joint Systems Architecture Development</i>
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B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	4.851	4.088	9.953	0.000	9.953
Current President's Budget	4.695	4.079	9.593	0.000	9.593
Total Adjustments	-0.156	-0.009	-0.360	0.000	-0.360
• Congressional General Reductions	0.000	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.147	-			
• FFRDC	-0.009	-0.009	-	-	-
• INV-D-032 CDBP - Biological and Chemical Threats Preparedness	-	-	-0.360	-	-0.360

Change Summary Explanation

Nominal increase in FY19 program will result in an increased focus on increased level of effort for land warfare and munitions and electronic warfare studies. In FY2020, the increase (approximately \$4M) in JSAD funds is due to new and expanded mission areas and requirements in the Assistant Secretary of Defense for Acquisition (ASD(A) portfolio as a result of the USD A&S reorganization. These funds will support the Electronic Warfare Executive Committee recommended projects on Electronic Battle Management (EMBM), and the development of a comprehensive electronic warfare strategy to identify gaps and requirements across the Department. The funds will include support to the mission engineering analyses and integration to incorporate soft kill and Electronic Warfare effects, and weapon systems in critical mission thread areas in order to meet evolving threats.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
875: Portfolio Systems Acquisition (PSA)	18.808	0.000	2.679	4.092	0.000	4.092	4.413	4.672	4.257	4.398	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

⁽⁺⁾ The sum of all Prior Years is \$0.004 million less than the represented total due to several projects ending

Note

FY19 decrease represents realigning funds from the 875: Portfolio Systems Acquisition (PSA) project to the 220: Electronic Warfare Executive Committee (EW EXCOM) subproject within the Joint Systems Architecture Development (JSAD) mission. Funding enables a base program for EW EXCOM to support the Warfighter by strengthening portfolio management and reform initiatives within the growing area of electronic warfare. In FY2020, the increase (approximately \$4M) in JSAD funds is due to new and expanded mission areas and requirements in the Assistant Secretary of Defense for Acquisition (ASD(A)) portfolio as a result of the USD A&S reorganization. These funds will support the Electronic Warfare Executive Committee recommended projects on Electronic Battle Management (EMBM), and the development of a comprehensive electronic warfare strategy to identify gaps and requirements across the Department. The funds will include support to the mission engineering analyses and integration to incorporate soft kill and Electronic Warfare effects, and weapon systems in critical mission thread areas in order to meet evolving threats..

A. Mission Description and Budget Item Justification

The Department's 2005 Quadrennial Defense Review (QDR) laid out the need for an institutional reorientation or shift in emphasis from organization-specific to enterprise-wide approaches. This meant: (1) horizontal integration within the Department and unity of effort through greater interagency collaboration; (2) engaging in a coordinated and portfolio-based approach to planning, programming, budgeting and execution; and (3) significant reforms at the governance, management and execution levels. The Department's 2010 QDR report further addressed reforming how we buy, noting that the conventional acquisition process is too long and too cumbersome to fit the needs of the many systems that require continuous changes and upgrades - a challenge that will become only more pressing over time. Better Buying Power (BBP) is the implementation of best practices to strengthen the Defense Department's buying power, improve industry productivity, and provide an affordable, value-added military capability to the Warfighter. Launched in 2010, BBP encompasses a set of fundamental acquisition principles to achieve greater efficiencies through affordability, cost control, elimination of unproductive processes and bureaucracy, and promotion of competition. BBP initiatives also incentivize productivity and innovation in industry and Government, and improve tradecraft in the acquisition of services. The Department will improve how it matches requirements with mature technologies, maintains disciplined systems engineering approaches. To accomplish this direction, there needed to be a focused goal and concerted emphasis on shifting from acquisition of individual systems to portfolio management (or portfolio systems acquisition). This program enables collaborative efforts to implement the QDR direction outlined above and advance BBP initiatives to achieve portfolio systems acquisition goals and to develop and implement acquisition reform initiatives.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense				Date: February 2019		
Appropriation/Budget Activity 0400 / 6		R-1 Program Element (Number/Name) PE 0604875D8Z I Joint Systems Architecture Development		Project (Number/Name) 875 I Portfolio Systems Acquisition (PSA)		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Portfolio Systems Acquisition (PSA)		0.000	2.679	4.092	0.000	4.092
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 2019 Plans: -Continue and expand support Mission Area Portfolio Assessments and warfare areas to identify portfolio and program synergies, reduce duplication, and identify opportunities for cost savings. -Conduct additional analyses and support implementation of updated Better Buying Power (BBP) initiatives. -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. -Continue "reliability by design", capability, capacity, and lethality analyses and support to programs. -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 IAMD portfolio. -Continue analytical support for the munitions process, from requirements generation to demilitarization. - Continue A&S staff re-organization efforts resulting from the dissolution of OUSD(AT&L). - Pilot and establish Mission Engineering practice within A&S to evaluate warfighter priority mission areas with a rigorous, data-driven analytic process to determine how systems work together in an operationally relevant environment and identify ways to integrate technology and systems to provide affordable capability solutions for our warfighters						
FY 2020 Base Plans: -Continue to expand support Mission Area Portfolio Assessments and warfare areas to identify portfolio and program synergies, reduce duplication, and identify opportunities for cost savings. -Conduct additional analyses and support implementation of updated Better Buying Power (BBP) initiatives. -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. -Continue "reliability by design", capability, capacity, and lethality analyses and support to programs.						

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense				Date: February 2019		
Appropriation/Budget Activity 0400 / 6		R-1 Program Element (Number/Name) PE 0604875D8Z / <i>Joint Systems Architecture Development</i>		Project (Number/Name) 875 / <i>Portfolio Systems Acquisition (PSA)</i>		
B. Accomplishments/Planned Programs (\$ in Millions)						
		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
-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 IAMD portfolio. -Continue analytical support for the munitions process, from requirements generation to demilitarization. - Continue A&S staff re-organization efforts resulting from the dissolution of OUSD(AT&L). - Pilot and establish Mission Engineering practice within A&S to evaluate warfighter priority mission areas with a rigorous, data-driven analytic process to determine how systems work together in an operationally relevant environment and identify ways to integrate technology and systems to provide affordable capability solutions for our warfighters FY 2020 OCO Plans: -N/A FY 2019 to FY 2020 Increase/Decrease Statement: FY2020 increase will result in greater focus on maritime interdiction/mission engineering and ground interdiction personnel. Specifically personnel will develop outcomes based evaluation metrics and experimental designs to provide evaluation of mission effects/kill chains. Ground interdiction personnel provide precision strike analysis to exploit projection of power via munitions intended to precisely hit specific surface targets, create area effects, or provide area denial, while minimizing collateral damage with increased lethality.						
Accomplishments/Planned Programs Subtotals		0.000	2.679	4.092	0.000	4.092
C. Other Program Funding Summary (\$ in Millions)						
N/A						
Remarks						
D. Acquisition Strategy						
Not Applicable						
E. Performance Metrics						
Not Applicable						

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
220: Electronic Warfare Executive Committee	0.294	4.695	1.400	5.501	0.000	5.501	5.365	5.003	5.111	5.216	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Electronic Warfare (EW) Executive Committee (EXCOM) - co-chaired by the Under Secretary of Defense for Acquisition, Technology and Logistics and the Vice Chairman of the Joint Chiefs of Staff - is tasked to provide senior oversight, coordination, budget/capability harmonization, and advice on EW matters to the Secretary of Defense, Deputy Secretary of Defense, and the Deputy's Management Action Group. 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.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Electronic Warfare Executive Committee	4.695	1.400	5.501	0.000	5.501
Description: Funds are to conduct analytic assessments of fielded and planned U.S. EW capabilities, threat analysis, and physics-based modeling and simulation of electronic warfare capabilities to support the Deputy Secretary of Defense-directed Electronic Warfare (EW) Executive Committee (EXCOM).					
FY 2019 Plans: - 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.					
FY 2020 Base Plans: -Development a comprehensive electronic warfare strategy to identify EW gaps and requirements across the Department. - Develop a mission engineering analyses and integration to incorporate soft kill and Electronic Warfare effects, and weapon systems in critical mission thread areas in order to meet evolving threats. -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.					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense				Date: February 2019		
Appropriation/Budget Activity 0400 / 6		R-1 Program Element (Number/Name) PE 0604875D8Z / <i>Joint Systems Architecture Development</i>		Project (Number/Name) 220 / <i>Electronic Warfare Executive Committee</i>		
B. Accomplishments/Planned Programs (\$ in Millions)						
		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
<p>- Continue to perform the necessary analytic underpinning to develop and field advanced EW capabilities, including EW manning, training, exercises, modeling and simulation.</p> <p>- Adds support Electromagnetic Battle Management (EMBM) activities to include: Spectrum consumption modeling, Force composability, data sharing policy standardization, Distributed kill-chains using heterogeneous (joint / partner / different industry partners) capabilities, and Joint airborne electronic attack mission optimization (simulation analysis).</p> <p>FY 2020 OCO Plans: N/A</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY2020 Increase due to an increasing emphasis on 3 electronic warfare initiatives:</p> <ul style="list-style-type: none"> - Dedicated Red Team support - Electronic Battle Management (EMBM) activities - Training initiatives and virtual tool development 						
Accomplishments/Planned Programs Subtotals		4.695	1.400	5.501	0.000	5.501
C. Other Program Funding Summary (\$ in Millions) N/A						
Remarks						
D. Acquisition Strategy Not Applicable						
E. Performance Metrics Not Applicable						

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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)							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	1,165.091	204.268	270.013	260.267	-	260.267	290.404	294.646	293.975	301.336	Continuing	Continuing
940: Central Test and Evaluation Investment Program (CTEIP)	1,165.091	204.268	270.013	260.267	-	260.267	290.404	294.646	293.975	301.336	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Since its inception in FY 1990, this program element (PE) has been used to fund the development of critically needed, high-priority Test and Evaluation (T&E) capabilities for joint/multi-Service requirements. The Central Test and Evaluation Investment Program (CTEIP) uses a corporate investment approach to combine Service, Defense, and other Government agencies T&E needs, maximize opportunities for joint efforts, and avoid unwarranted duplication of test capabilities. CTEIP focuses investments on projects that will have high productivity returns on investment. Projects under the CTEIP PE support two basic tasks: investments to improve and develop the test capabilities base (Joint Improvement and Modernization (JIM) projects) and development of near-term solutions to test capability shortfalls in support of ongoing operational test programs (Resource Enhancement Projects (REP)).

The JIM funds critically needed T&E investments in the major functional areas of air combat; autonomy; armament and munitions; Command, Control, Communications, Computers, and Intelligence (C4I) networks; common range instrumentation; directed energy; electronic combat; cyber warfare; land combat; sea combat; space combat; strategic warfare, target systems; and test environments. Examples of project subject matter include infrastructure developments needed for testing hypersonic weapon systems, electronic warfare test capability developments to address critical testing shortfalls against advanced threats, long range airborne telemetry, threat simulator development, mobile optical tracking, nuclear survivability, and unmanned and autonomous systems. CTEIP continues to serve as the focal point for fostering common architectures throughout the test and training communities to enhance the sharing of resources and linkages between test and training ranges.

CTEIP has provided special focus to institutionalize the use of modeling and simulation (M&S) as a practical test tool, to link ranges to enhance inter-range and inter-Service cooperation and resource sharing, and to ensure development and acquisition of common instrumentation necessary for a more efficient test infrastructure.

The REP funds development of near-term solutions for critical ongoing operational tests supporting decisions on major, high-priority defense acquisition programs. These unanticipated operational test (OT) capability requirements arise from several sources such as a new threat system identified during OT planning, acquisition of foreign military assets that are critical in determining weapon system operational effectiveness, short timelines between system design maturity and scheduled OT, and emerging technologies and test requirements resulting from operational concept changes mandated by Congress or Director, Operational Test & Evaluation (DOT&E), or system-of-systems testing. Funding these activities under the CTEIP provides the opportunity to coordinate and integrate these near-term test requirements with the total DoD test and evaluation investment planning, and ensures their availability for other programs that may have similar testing requirements.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I</i> BA 6: <i>RDT&E Management Support</i>	R-1 Program Element (Number/Name) PE 0604940D8Z <i>I Central Test and Evaluation Investment Program (CTEIP)</i>
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This Budget Activity 6 PE includes special studies, analyses, project improvements, quick reaction efforts, and strategic planning related to test capabilities and infrastructure, and supports the development and application of proven technologies to provide major test and evaluation capabilities required to meet DoD component weapon system test requirements.

The FY2020 CTEIP budget is described in detail below. The FY2020 includes increased investments in high-priority hypersonic ground and open air range test capability developments and increased investments for critically needed upgrades to DoD Threat Models and Simulations.

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	211.325	258.796	261.529	-	261.529
Current President's Budget	204.268	270.013	260.267	-	260.267
Total Adjustments	-7.057	11.217	-1.262	-	-1.262
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	12.300			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-6.302	-			
• FFRDC Reduction	-0.755	-1.083	-	-	-
• Programmatic Change	-	-	-1.262	-	-1.262

Change Summary Explanation

FY2019: Congressional add of +\$12.3M provided in Department of Defense Appropriation Bill (P.L. 115-245) accommodates a program increase, to include funding for the Defense Threat Center of Excellence.

FY2020: Programmatic change (other program change).

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
Title: Central Test and Evaluation Investment Program	204.268	270.013	260.267
Description: JIM Projects: - Initiated requirements development and project planning for the Autonomous Systems Test Capability (ASTC) project that develops test capability for Service autonomous systems. - Initiated requirements development and project planning for the Advanced Durability Testing (AVDT) that develops a multi-axle vehicle chassis simulator and a drive train simulator at Aberdeen Proving Grounds, MD. - Initiated requirements development and project planning for the Mission System Test Capability (MSTC) project that develops the capability to support integration and interoperability testing for advanced 4th and 5th generation aircraft data links Multi-			

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I</i> BA 6: <i>RDT&E Management Support</i>		R-1 Program Element (Number/Name) PE 0604940D8Z <i>I Central Test and Evaluation Investment Program (CTEIP)</i>		
C. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<p>Function Advanced Data Link (MADL) and Tactical Targeting Network Technology (TTNT) in a ground test, simulation environment.</p> <ul style="list-style-type: none"> - Initiated the development of requirements and project planning for the Radar Air-to-Ground Environment (RAGE) project that develops an installed test facility, ground test capability for testing advanced aircraft radars in high density air-to-air and air-to-ground environments. - Initiated the development of requirements and project planning for the Unmanned Aircraft Systems Test and Evaluation Improvements (UAS-TEI) and integrated Autonomous System Test Tool Kits to develop the capability to safely operate Unmanned and Autonomous aerial vehicles in controlled airspace. - Initiated the development of requirements and project planning for the Mobile High Energy Laser Measurement (MHELM) project to support testing of directed energy weapon systems. - Completed preliminary design for the Advanced Range Tracking and Imaging System (ARTIS) project to provide an integrated next generation suite of optical tracking systems to increase performance, reduce costs, and establish secure reliable optical tracking capability on DoD open-air ranges. - Completed requirements development, risk reduction and preliminary design for key elements of the Fast Burst Reactor Upgrade (FBRU) project. - Completed acceptance of the green G550 AEW aircraft and awarded the development contract for the Commercial Derivative Aircraft Based Instrumentation Telemetry System (CBITS) project that provides expanded telemetry support for aircraft and missile defense testing in inter-range and broad ocean area weapons testing. - Completed system development and an Initial Operational Capability of the Cyber Test Analysis and Simulation Environment (CyberTASE) project that establishes the ability to test enterprise level IT systems against increasingly robust Cyber threats. Continued development toward Initial Operational Capability. - Completed testing and achieved full operational capability of the Joint Distributed Infrared Countermeasures (IRCM) Ground Test System (JDIGS) project that provides end-to-end ground testing of IRCM systems. - Completed Initial Operational Capability providing a DoD multi-level secure and cross-domain data management T&E network environment for the Multi-Level Secure Joint/Coalition Network Environment (MLS-JCNE) project. Continued Block 2 to provide a multi-level file transfer, and multi-level work station for cross-domain data management in a T&E network environment. - Completed critical design for the UAS based Scoring sub-project at Eglin AFB, FL and contractor demonstrations of early target boat control software at Port Hueneme, CA and continued system development for the Swarm Autonomy and Scoring project that upgrades existing High Speed Maneuverable Surface Targets (HSMST) with semi-autonomous control and establishes UAS overhead scoring capabilities for testing against representative surface swarming threats. - Completed design and continued development of the Mid-Pressure Arc Heater (MPAH) project to expand the H2 Hypersonic Test Facility at Arnold Engineering Development (AEDC) Complex, TN to provide higher enthalpy at the mid-pressure altitudes to enable ground materials testing of components of hypersonic systems. 				

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C. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<ul style="list-style-type: none"> - Continued design activities for the Hypersonic Test Capability Improvement Project (Phoenix) to provide a clean air, variable Mach ground test capability for hypersonic system prototypes from Mach 4 to Mach 7.5. Heater pit construction and refractory brick procurement initiated. Source selection for the system integration contract completed. -Initiated the Unmanned Aerial Vehicle (UAV) Range project to provide Global Hawk UAVs equipped with telemetry, Light Detection and Ranging System (LIDAR) and optical tracking for inflight data collection of hypersonic systems. - Continued the development of the Tunnel 9 High Mach Number project that develops a Mach 18 test capability at the AEDC White Oak, MD facility to support aero/aerothermodynamic modeling and simulation supporting intermediate range and strategic boost glide vehicle and maneuvering system concepts. - Continued the development of requirements and started design activities for the High Altitude LIDAR Atmospheric Sensing (HALAS) system that provides DOD launch and flight test ranges with improved ability to measure atmospheric conditions to reduce flight test evaluation uncertainty and improve launch and recovery operations. - Continued design work to upgrade the Holloman AFB High Speed Test Track to provide a full scale rain erosion capability to validate vehicle structural designs and qualify hypersonic weapon systems for flight in an open air environment. - Continued design activities for the G-Range Weather Effects project that upgrade the 3 inch G-range test track at AEDC to provide a small scale dust, rain, and snow erosion test capability. - Continued development under the M&S for Weather Effects on Hypersonic Systems project that provides a database of realistic and relevant weather conditions as a basis for ground test requirements, and develops advanced material response models validated with improved ground test data to predict weather erosion in flight. - Continued the development of the Transient Thermal Analysis Software (TTAS) project that provides improved capabilities for predicting aerothermal and ablation response to high speed, high temperature flow in ground and flight test environments. - Initiated the Reconfigurable RF Target Simulator (RRFTS) project to upgrade an Eglin AFB facility to test prototype sensors in a simulated hypersonic target and scene environment. - Completed development and integration of 16 Radar Signal Emulators (RSE) at the Nevada Test and Training Range (NTTR), NV and Navy Land and Sea Ranges at China Lake and NAS Pt Magu, CA to provide open-loop, transmit-only simulators that are representative of threat radar systems operating in the C and S radio frequency (RF) bands. Initiated procurement for 5 classified threat devices to be integrated with RSEs. - Completed critical design and continued system development of the Closed Loop PESA Simulator (CLPS) project to develop a closed-loop radar system that will closely replicate the performance of a widely fielded Western Pacific (WESTPAC) long-range surface-to-air missile (SAM) system. - Completed integration of four threat command posts at the Electronic Combat Range, China Lake, CA and continued system development for the Integrated Air Defense System (IADS) Enhancements project that fields high-priority, threat-representative Command Post (CP) models to open-air test ranges. - Completed Initial Operating Capability for the Next Generation Electronic Warfare Environment Generator (NEWEG) Build B project at NAS Patuxent River, MD to provide electronic warfare simulation capabilities for testing future Electronic Attack and 				

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
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C. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<p>Electronic Support Measures systems. Continued procurement and integration for the Full Operational Capability systems at 3 sites.</p> <ul style="list-style-type: none"> - Completed critical design and continued development of the initial unit for integration testing. Continued system development for the Advanced Dynamic Transmitter Array (ADTRA) project to provide a complex, dynamic radio frequency (RF) threat environment at the Benefield Anechoic Facility (BAF). - Continued Integrated Technical Evaluation and Analysis of Multiple Sources (ITEAMS) activities to provide detailed analysis and validation of threat system designs and operational techniques for integration into ongoing electronic warfare projects. - Completed preliminary design and risk reduction testing for the Advanced Weapons Effects Test Capability (AWETC) project to develop a capability to more accurately measure fragment characteristics of explosive weapons(2mm size and above)and more accurately estimate collateral damage distances. - Completed Lot 1 site activation at 6 ranges for the Common Range Integrated Instrumentation System (CRIIS) project that establishes a high dynamic, sub-meter, military standard (MILS) capable range instrumentation system. Continued fielding of Lots 2 and 3. Completed F-22 configuration deliveries. Initiated software upgrade to Windows 10 and continued sustainment. - Continued early operational capability fielding of the Integrated Network Enhanced Telemetry (iNET) Project Block I capability to develop a network-enhanced aeronautical telemetry capability for T&E ranges and facilities. The project will be evaluated after flight test in mid FY19 to determine the best approach to providing this capability. - Completed Initial Operational Capability for the Network Centric Weapon (NCW) T&E Environment project that established the capability to test and evaluate an NCW in a distributed end-to-end simulation environment. Continued system design and development for Increment 2. - Completed fielding of a upgraded Ka-Band radar at the Atlantic Test Range; new HF antenna and refurbished target support pylon at the National Radar Test Facility, and continued development for the Radar Cross Section Range Relevance (RCSRR) project that upgrades radar cross section measurement capabilities of advanced low observable technologies at the Atlantic Test Range, Patuxent River NAS, MD and the National RCS Test Facility, Holloman AFB, NM. - Continued the Joint Strike Fighter Knowledge Management (KM) project to establish a next-generation KM capability that utilizes the latest in virtualization technologies, methodologies, and best practices for efficient and effective use of T&E data. Completed development of small form factor instrumentation prototypes for data collection and data analytics systems to support F-35 Initial Operational Test and Evaluation. - Continued threat system simulator, modeling and simulation development efforts to improve integration; reduce potential duplication and ensure that accurate, cost-effective representations of threat systems are available to support testing. - Initiated risk reduction activities under the Enhanced Solutions Process (ESP) for eight potential FY20 multi-Service T&E developments recommended by Service Test and Evaluation Executives. - Initiated development of requirements and project planning for Radio Frequency and Infrared Modeling and Simulation development. 				

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
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C. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<p>Resource Enhancement Projects:</p> <ul style="list-style-type: none"> - Completed the Boosted Zombie Target (BZT) development of multi-stage economical targets for Patriot Advanced Capability – 3 (PAC-3), which integrated a Government Furnish Equipment (GFE) booster onto a blue "Zombie" maneuvering target. - Completed development of Joint Standard Instrumentation Suite (JSIS) Phase 1 that measured and collected signature, Time Space System Position Instrumentation (TSPI), and related data from key flight trajectory segments of threat missile and hostile fire munitions (e.g., small arms and RPG) firings to support evaluation of the missile/hostile fire warning systems such as the Advance Threat Warning (ATW) system. - Completed development of Submarine Launched Modular 3-inch Device (SLAM-3D), which provided a Cluster Duncan countermeasure emulator to help resolve the Anti-Submarine Warfare COI for the Mk 54 Mod 1 Torpedo. - Continued development of Advanced Communication Threat Testing Suites (ACTTS) Uplink Capability to develop an electronic warfare (EW) threat representative uplink jamming system to support test and evaluation of end to end satellite system responsiveness to threat systems operating in applicable bands. - Continued development of Airborne Early Warning Interoperability Simulator (AEIS) to develop the hardware and software necessary to generate a properly spaced, dense target and Electronic Counter Measure (ECM) environment for injection-mode Installed Systems Test Facility testing of the E-2D Hawkeye mission system. - Continued development of additional enhancements to Air Warfare Battle Shaping (AWBS) investments to improve air-to-air range infrastructure for NAWC-WD. - Continued development of Cognitive Electronic Warfare (Cognitive EW) Flight Test to evaluate an advanced EW system against emerging threat representations. - Continued development of Common Operational Test Vehicle and Engagement Real-Time Test Instrumentation (COVERT-I) to reduce the data collection footprint in Abrams tanks and Bradley fighting vehicles by reducing from three unique data collectors to one modular, scalable data collector with increased storage capacity. - Continued development of General Threat Torpedo (GTT) to develop a threat torpedo surrogate with upgradable interchangeable segments as an upgrade replacement for the current threat surrogate torpedo. - Continued development of Integrated Digital Acquisition Radar Environment - Upgrade (IDARE-U) to upgrade two NAWCWD Electronic Combat Range OEM Radars' analog output with digital upgrade for downstream digital messaging. - Continued development of Joint Standard Instrumentation Suite (JSIS) Phase 2 to measure and collect missile attitude (6DOF) as well as signature, TSPI, and related data for a larger portion of the threat MANPADS trajectory at the required accuracies within a single firing to support evaluation of the missile/hostile fire warning systems such as the Advance Threat Warning (ATW) system. - Continued development of the Medium Range Target Engagement Radar (MR-TER) Radar System Emulator (RSE) to develop and integrate TER waveform replication capability into C-Band RSEs. 				

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
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C. Accomplishments/Planned Programs (\$ in Millions) - Continued development of the Pulsed Doppler Emitter Capability Payload for Aerial Targets (PDEC-163) to develop kinematic threat representations and threat representative emissions to provide the DDG-1000 OT SUT with the ability to collect data necessary for COTF to accredit the DDG-1000's fire control loop weapons system response to threat targets. - Continued development of Space Fence Evaluation of Radar Effectiveness (SFERES) to fabricate a 3-axis stabilized CubeSat which will launch two spheres to support accurate evaluation of the Space Fence radar. - Initiated the development of Ultra Low-band Time Difference Of Arrival (UT) to develop the capability for a time difference of arrival (TDOA) multi-aircraft test configuration to support three aircraft under test in both the Air Combat Environment Test and the Evaluation Facility (ACETEF) and Electronic Combat Simulation and Evaluation Lab (ECSEL). FY 2019 Plans: JIM Projects: - Award design contract and complete a prototype system for the Advanced Range Tracking and Imaging System (ARTIS) project to provide the next generation of optical tracking mounts on DoD open-air ranges. - Complete requirements and project planning, and initiate design and concept development for the Autonomous Systems Test Capability (ASTC) project that develops test capability for Service autonomous systems. - Complete requirements and project planning, and award design contract for the Advanced Durability Testing (AVDT) that develops a multi-axle vehicle chassis simulator and a drive train simulator at Aberdeen, MD. - Complete planning, prototype test, and fabrication of safety blocks for the Fast Burst Reactor Upgrade (FBRU) project. Work includes development of an alumina coating process to reduce wear on the High Enriched Uranium (HEU) components and initiation of planning process for the fabrication of ring components. - Complete requirements and project planning, and initiate design and concept development for Mobile High Energy Laser Measurement (MHELM) project to support testing of directed energy weapon systems. - Complete design and initiate development for the Commercial Derivative Aircraft Based Instrumentation Telemetry System (CBITS) project that provides expanded telemetry support for aircraft and missile defense testing in inter-range and broad ocean area weapons testing. - Continue system development of the Cyber Test Analysis and Simulation Environment (CyberTASE) project that establishes the ability to test enterprise level IT systems against increasingly robust Cyber threats. - Complete development of the multi-level work station for cross-domain data management and continue development of a standardized, multi-level file transfer capability for the Multi-Level Secure Joint/Coalition Network Environment (MLS-JCNE) project that provides an enterprise-level multi-level secure and cross-domain data management T&E network environment. - Complete requirements and project planning, and initiate design and concept development for the Mission System Test Capability (MSTC) project that develops the capability to support integration and interoperability testing for advanced 4th and 5th generation aircraft data links (MADL and TTNT) in a ground test, simulation environment.		FY 2018	FY 2019	FY 2020

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C. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<ul style="list-style-type: none"> - Complete requirements and project planning, and initiate design and concept development for the Radar Air-to-Ground Environment (RAGE) project that develops an installed test facility, ground test capability for testing advanced aircraft radars in high density air-to-air and air-to-ground environments. - Complete development and initiate integration of the UAS based Scoring sub-project at Eglin AFB, FL and award development contract for semi-autonomous control High Speed Maneuverable Surface Targets (HSMST) for the Swarm Autonomy and Scoring project that upgrades HSMST with semi-autonomous control and establishes UAS overhead scoring capabilities for testing against representative surface swarming threats. - Complete requirements and project planning, and initiate design and concept development for the Unmanned Aircraft Systems Test and Evaluation Improvements (UAS-TEI) and integrated Autonomous System Test Tool Kits to develop the capability to safely operate Unmanned and Autonomous aerial vehicles in controlled airspace. - Continue development, fabrication, and testing of the Mid-Pressure Arc Heater (MPAH) system to expand the H2 Hypersonic Test Facility at Arnold Engineering Development Complex, TN to provide higher enthalpy at the mid-pressure altitudes to enable ground materials testing of components of hypersonic systems. - Continue design and fabrication activities for the Hypersonic Test Capability Improvement Project (Phoenix) to provide a clean air, variable Mach ground test capability for hypersonic system prototypes from Mach 4 to Mach 7.5. Heater pit construction and refractory brick procurement completed. Heater assembly and bottle procurement started. -Continue the UAV Range (UAV Range) project to provide Global Hawk UAVs equipped with Telemetry, LIDAR and Optical tracking for inflight data collection of hypersonic systems. - Complete installation and test, and achieve Initial Operational Capability of the Tunnel 9 High Mach Number project that develops a Mach 18 test capability at the AEDC White Oak, MD facility to support aero/aerothermodynamic modeling and simulation to support intermediate range and strategic boost glide vehicle and maneuvering system concepts. - Complete the design and build stationary and transportable prototypes of the High Altitude LIDAR Atmospheric Sensing (HALAS) system that provides DOD launch and flight test ranges with improved ability to measure atmospheric conditions to reduce flight test evaluation uncertainty and improve launch and recovery operations. - Complete the design, fabrication, and achieve Initial Operational Capability of the Holloman AFB High Speed Test Track upgrade to provide full scale rain erosion capability to validate vehicle structural designs and qualify hypersonic weapon systems for flight in an open air environment. - Complete fabrication and test, and achieve Initial Operational Capability of the rain components of G-Range Weather Effects project that upgrades the 3 inch G-range test track at AEDC to provide a small scale dust, rain, and snow erosion test capability. Start development of the 8 inch track capability - Continue development under the M&S for Weather Effects on Hypersonic Systems project that provides a database of realistic and relevant weather conditions as a basis for ground test requirements, and develops advanced material response models validated with improved ground test data to predict weather erosion in flight. 				

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
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C. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<ul style="list-style-type: none"> - Continue the development of the Transient Thermal Analysis Software (TTAS) project that provides improved capabilities for predicting aerothermal and ablation response to high speed, high temperature flow in ground and flight test environments. Achieve Initial Operational Capability of Fluid Thermal Structural Interaction (PTSI) model #1 of three planned releases. - Continue development of the Reconfigurable RF Target Simulator (RRFTS) project to upgrade an Eglin AFB facility to test prototype sensors in a simulated hypersonic target and scene environment. - Initiate the Workforce Development project to improve the depth and breadth of DoD hypersonic workforce skills. - Initiate other hypersonic improvement projects based need and maturity of the technologies. - Complete procurement and integration of 5 classified threat devices for use with Radar Signal Emulators (RSE) at the Nevada Test and Training Range (NTTR), NV and Navy Land and Sea Ranges providing simulators that are representative of threat radar systems operating in the C and S radio frequency (RF) bands. - Complete manufacturing and integration for the first system of the Closed Loop PESA Simulator (CLPS) project that provides a closed-loop radar system that replicates the performance of a widely fielded Western Pacific (WESTPAC) long-range surface-to-air missile (SAM) system. Continue development and integration of the second system. - Continue development and integration of additional threat command posts at the Electronic Combat Range, China Lake, CA for the Integrated Air Defense System (IADS) Enhancements project that fields high-priority, threat-representative Command Post (CP) models to open-air test ranges. - Continue procurement and integration of the Next Generation Electronic Warfare Environment Generator (NEWEG) Build B project at NAS Patuxent River, MD, Pt Mugu, CA and Edwards AFB, CA to provide electronic warfare simulation capabilities for testing future Electronic Attack and Electronic Support Measures systems. - Complete unit 1 for integration testing. Continue development units 2 and 3 for the Advanced Dynamic Transmitter Array (ADTRA) project to provide a complex, dynamic radio frequency (RF) threat environment at the Benefield Anechoic Facility (BAF). Continue system development. - Continue Integrated Technical Evaluation and Analysis of Multiple Sources (ITEAMS) activities to provide detailed analysis and validation of threat system designs and operational techniques for integration into ongoing electronic warfare projects. - Complete the critical design and the start system demonstration and test phase of the Advanced Weapons Effects Test Capability (AWETC) project to develop a capability to more accurately measure fragment characteristics of explosive weapons (2mm size and above) and more accurately estimate collateral damage distances. - Complete Lot 3 deliveries and the Windows 10 upgrade for the Common Range Integrated Instrumentation System (CRIIS) project that establishes high dynamic, sub-meter, MILS capable range instrumentation system. Continue sustainment. - Complete early operational capability fielding of the Integrated Network Enhanced Telemetry (iNET) Project Block I capability to develop a network-enhanced aeronautical telemetry capability for T&E ranges and facilities. - Continue system development of Increment 2 for the Network Centric Weapon (NCW) T&E Environment project that establishes the capability to test NCW in a distributed end-to-end simulation environment. 				

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
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C. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<ul style="list-style-type: none"> - Complete preliminary design and continue development for the Atlantic Test Range next generation Advanced Dynamic Aircraft Measurement System (ADAMS-3). Complete the Digital Signal Processing development, Target Preparation upgrade and C2 System upgrade, and initiate development of the Semi-automated Target Rollover and Calibration Pit refurbishment for the National Radar Test Facility. The Radar Cross Section Range Relevance (RCSRR) project upgrades radar cross section measurement capabilities of advanced low observable technologies at the Atlantic Test Range, Patuxent River NAS, MD and the National RCS Test Facility, Holloman AFB, NM. - Initiate development of requirements and project planning for the Next Generation Turbine Engine (NGTE) Sea Level RAM project that upgrades turbine engine capability to test advanced, larger volume engines at Arnold Engineering Development Center, TN. - Continue the Joint Strike Fighter - Knowledge Management (KM) project to establish a next-generation KM capability that utilizes the latest in virtualization technologies, methodologies, and best practices for efficient and effective use of T&E data. - Complete risk reduction activities under the Enhanced Solutions Process (ESP) for eight potential FY20 multi-Service T&E developments recommended by Service Test and Evaluation Executives. - Complete requirements development and project planning and initiate preliminary design for priority Radio Frequency and Infrared Modeling and Simulation development projects. - Continue threat system simulator, modeling and simulation development efforts to improve integration; reduce potential duplication and ensure that accurate, cost-effective representations of threat systems are available to support testing. <p>Resource Enhancement Projects:</p> <ul style="list-style-type: none"> - Complete development of Airborne Early Warning Interoperability Simulator (AEIS) to develop the hardware and software necessary to generate a properly spaced, dense target and ECM environment for injection-mode Installed Systems Test Facility testing of the E-2D Hawkeye mission system. - Complete development of additional enhancements to Air Warfare Battle Shaping (AWBS) investments to improve air-to-air range infrastructure for NAWC-WD. - Complete development of Cognitive Electronic Warfare (Cognitive EW) Flight Test to evaluate an advanced EW system against emerging threat representations. - Complete development of Common Operational Test Vehicle and Engagement Real-Time Test Instrumentation (COVERT-I) to reduce the data collection footprint in Abrams tanks and Bradley fighting vehicles by reducing from three unique data collectors to one modular, scalable data collector with increased storage capacity. - Complete development of Integrated Digital Acquisition Radar Environment - Upgrade (IDARE-U) to upgrade two NAWCWD Electronic Combat Range OEM Radars' analog output with digital upgrade for downstream digital messaging. - Complete development of Joint Standard Instrumentation Suite (JSIS) Phase 2 to measure and collect missile attitude (6DOF) as well as signature, TSPI, and related data for a larger portion of the threat man-portable air defense systems (MANPADS) 				

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
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C. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
trajectory at the required accuracies within a single firing to support evaluation of the missile/hostile fire warning systems such as the Advance Threat Warning (ATW) system. - Complete development of the Medium Range Target Engagement Radar (MR-TER) Radar System Emulator (RSE) to develop and integrate TER waveform replication capability into C-Band RSEs. - Complete development of Space Fence Evaluation of Radar Effectiveness (SFERES) to fabricate a 3-axis stabilized CubeSat which will launch two spheres to support accurate evaluation of the Space Fence radar. - Complete development of Ultra Low-band Time Difference Of Arrival (UT) to develop the capability for a time difference of arrival (TDOA) multi-aircraft test configuration to support three aircraft under test in both the Air Combat Environment Test and the Evaluation Facility (ACETEF) and Electronic Combat Simulation and Evaluation Lab (ECSEL). - Continue development of Advanced Communication Threat Testing Suites (ACTTS) Uplink Capability to develop an electronic warfare (EW) threat representative uplink jamming system to support test and evaluation of end to end satellite system responsiveness to threat systems operating in applicable bands. - Continue development of General Threat Torpedo (GTT) to develop a threat torpedo surrogate with upgradable interchangeable segments as an upgrade replacement for the current threat surrogate torpedo. - Continue development of the Pulsed Doppler Emitter Capability Payload for Aerial Targets (PDEC-163) to develop kinematic threat representations and threat representative emissions to provide the DDG-1000 OT SUT with the ability to collect data necessary for COTF to accredit the DDG-1000's fire control loop weapons system response to threat targets. FY 2020 Plans: JIM Projects: - Initiate up to eight New Start CTEIP development projects based on nomination by the Service Test and Evaluation Executives. - Continue development of the Advanced Range Tracking and Imaging System (ARTIS) project to provide the next generation of optical tracking mounts on DoD open-air ranges. - Complete design and continue development for the Autonomous Systems Test Capability (ASTC) project that develops test capability for Service autonomous systems. - Complete design and continue development for the Advanced Durability Testing (AVDT) that develops a multi-axle vehicle chassis simulator and a drive train simulator at Aberdeen, MD. - Complete the delivery and test of safety blocks for the Fast Burst Reactor Upgrade (FBRU) project. Continue development and fabrication of the ring components. - Transition development from the Test and Evaluation/Science and Technology (T&E/S&T) Program to CTEIP for the Dense Plasma Focus (DPF) project that that provides very short pulse nuclear weapons effects test capability for certification and testing new circuit designs. - Complete design and continue development for the Mobile High Energy Laser Measurement (MHELM) project to support testing of directed energy weapon systems.				

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
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C. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<ul style="list-style-type: none"> - Complete development and integration testing for the Commercial Derivative Aircraft Based Instrumentation Telemetry System (CBITS) project to provide expanded capability and capacity telemetry support for aircraft and missile defense testing in inter-range and broad ocean area test scenarios. - Complete Full Operational Capability for the Cyber Test Analysis and Simulation Environment (CyberTASE) project that establishes the ability to test enterprise level IT systems against increasingly robust Cyber threats. - Complete Full Operational Capability for the Multi-Level Secure Joint/Coalition Network Environment (MLS-JCNE) project file transfer cross domain solution at the Joint Mission Environment Test Capability (JMETC) SYSCON and the Multi-level Desktop at the Man Flight Simulator Facility, NAS Patuxent River, MD. Initiate sustainment. - Complete design and continue development for the Mission System Test Capability (MSTC) project that develops the capability to support integration and interoperability testing for advanced 4th and 5th generation aircraft data links in a ground test, simulation environment. - Complete design and continue development for the Radar Air-to-Ground Environment (RAGE) project that develops an installed test facility, ground test capability for testing advanced aircraft radars in high density air-to-air and air-to-ground environments. - Complete Full Operational Capability for the Swarm Autonomy and UAV Scoring project to upgrade existing High Speed Maneuverable Surface Targets (HSMST) with semi-autonomous control for testing against representative surface swarming threats. - Continue development for the Unmanned Aircraft Systems Test and Evaluation Improvements (UAS-TEI) and integrated Autonomous System Test Tool Kits to develop the capability to safely operate Unmanned and Autonomous aerial vehicles in controlled airspace. - Complete testing and achieve the Initial Operational Capability of the Mid-Pressure Arc Heater (MPAH) system to expand the H2 Hypersonic Test Facility at Arnold Engineering Development Complex, TN to provide higher enthalpy at the mid-pressure altitudes to enable ground materials testing of components of hypersonic systems. - Continue fabrication and test activities for the Hypersonic Test Capability Improvement Project (Phoenix) to provide a clean air, variable Mach ground test capability for hypersonic system prototypes from Mach 4 to Mach 7.5. Complete installation on five of the six major subsystems. -Continue the UAV Range project to provide Global Hawk UAVs equipped with Telemetry, LIDAR and Optical tracking for inflight data collection of hypersonic systems. - Complete the testing and achieve Initial Operational Capability on the stationary and transportable prototypes of the High Altitude LIDAR Atmospheric Sensing (HALAS) system that provides DOD launch and flight test ranges with improved ability to measure atmospheric conditions to reduce flight test evaluation uncertainty and improve launch and recovery operations. - Complete testing and achieve Final Operational Capability of the Holloman AFB High Speed Test Track upgrade to provide full scale rain erosion capability to validate vehicle structural designs and qualify hypersonic weapon systems for flight in an open air environment. 				

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide / BA 6: RDT&E Management Support</i>		R-1 Program Element (Number/Name) PE 0604940D8Z / <i>Central Test and Evaluation Investment Program (CTEIP)</i>		
C. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<ul style="list-style-type: none"> - Complete testing and achieve Final Operational Capability of the snow and ice components of G-Range Weather Effects project that upgrades the 3 inch test track at AEDC to provide a small scale dust, rain, and snow erosion test capability. Continue development of the 8 inch track capability. - Continue development under the M&S for Weather Effects on Hypersonic Systems project that provides a database of realistic and relevant weather conditions as a basis for ground test requirements, and develops advanced material response models validated with improved ground test data to predict weather erosion in flight. - Continue the development of the Transient Thermal Analysis Software (TTAS) project that provides improved capabilities for predicting aerothermal and ablation response to high speed, high temperature flow in ground and flight test environments. Achieve Initial Operational Capability of Fluid Thermal Structural Interaction (PTSI) model #2 of three planned releases. - Continue development of the Reconfigurable RF Target Simulator (RRFTS) project to upgrade an Eglin AFB facility to test prototype sensors in a simulated hypersonic target and scene environment. - Continue activities to improve capabilities of the hypersonic workforce with industry and academia. - Initiate requirements development and planning for projects that support hypersonic ground and open air range test capabilities consistent with need and technical maturity. - Complete development and integration testing for the second Closed Loop PESA Simulator (CLPS) that provides closed-loop radar systems that replicates the performance of a widely fielded Western Pacific (WESTPAC) long-range surface-to-air missile (SAM) system. - Complete integration of additional threat command posts at the Electronic Combat Range, China Lake, CA for the Integrated Air Defense System (IADS) Enhancements project that fields high-priority, threat-representative Command Post (CP) models to open-air test ranges. - Complete Full Operational Capability at the ECSEL, NAS Point Mugu, CA and BAF, Edwards AFB, CA for the Next Generation Electronic Warfare Environment Generator (NEWEG) Build B project to provide electronic warfare simulation capabilities for testing future Electronic Attack and Electronic Support Measures systems. - Complete units 2 and 3, integration testing with the Next Generation EW Environment system and continue development for the Advanced Dynamic Transmitter Array (ADTRA) project that provides a dense, complex, dynamic radio frequency (RF) signal threat environment at the Benefield Anechoic Facility (BAF). - Continue Integrated Technical Evaluation and Analysis of Multiple Sources (ITEAMS) activities that provide detailed analysis and validation of threat system designs and operational techniques for integration into ongoing electronic warfare projects. - Complete development and integration with full operational capability at 3 sites for the Advanced Weapons Effects Test Capability (AWETC) project to develop a capability to more accurately measure fragment characteristics of explosive weapons(2mm size and above)and more accurately estimate collateral damage distances. - Complete Windows 10 upgrade for the Common Range Integrated Instrumentation System (CRIIS) project that establishes high dynamic, sub-meter, MILS capable range instrumentation system. Transition sustainment to Services. 				

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I</i> BA 6: <i>RDT&E Management Support</i>		R-1 Program Element (Number/Name) PE 0604940D8Z <i>I Central Test and Evaluation Investment Program (CTEIP)</i>		
C. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<ul style="list-style-type: none"> - Complete Increment 2, RF and scene generation development, with Full Operational Capability established at 4 sites for the Network Centric Weapon (NCW) T&E Environment project that establishes the capability to test NCW in a distributed end-to-end simulation environment. - Complete requirements development and project planning and initiate design for the Next Generation Turbine Engine (NGTE) Sea Level RAM project that upgrades turbine engine capability to test advanced, larger volume engines at Arnold Engineering Development Center, TN. - Continue development of the ADAMS-3 radar facility for the Atlantic Test Range, Patuxent River NAS, MD. Complete development of Semi-automated target rollover, new fiber optics and perimeter security at the National Radar Test Facility. The Radar Cross Section Range Relevance Project (RCSRR) upgrades radar cross section measurement capabilities to measure and evaluate advanced low observable technologies. - Complete design and continue development for priority Radio Frequency and Infrared Modeling and Simulation development projects. - Continue ongoing threat system simulator, modeling and simulation development efforts, and initiate new threat simulator, modeling and simulation efforts in coordination with the Director, Operational Test and Evaluation (DOTE) Test and Evaluation Threat Resource Activity (TETRA). <p>Resource Enhancement Projects:</p> <ul style="list-style-type: none"> - Complete development of Advanced Communication Threat Testing Suites (ACTTS) Uplink Capability to develop an electronic warfare (EW) threat representative uplink jamming system to support test and evaluation of end to end satellite system responsiveness to threat systems operating in applicable bands. - Complete development of General Threat Torpedo (GTT) to develop a threat torpedo surrogate with upgradable interchangeable segments as an upgrade replacement for the current threat surrogate torpedo. - Complete development of the Pulsed Doppler Emitter Capability Payload for Aerial Targets (PDEC-163) to develop kinematic threat representations and threat representative emissions to provide the DDG-1000 OT SUT with the ability to collect data necessary for COTF to accredit the DDG-1000's fire control loop weapons system response to threat targets. - Initiate development of instrumented facilities to evaluate our next generation of sensors, weapons, platforms, and C4ISR systems in a realistic urban environment. - Initiate development of hardware simulators to test missile warning systems of new generation electronic warfare (EW) suites in a dynamic environment. - Initiate the development of non-intrusive instrumentation to address near term OT capability shortfalls to evaluate advanced sensor system performance in harsh environments. <p>FY 2019 to FY 2020 Increase/Decrease Statement:</p>				

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I</i> BA 6: <i>RDT&E Management Support</i>		R-1 Program Element (Number/Name) PE 0604940D8Z <i>I Central Test and Evaluation Investment Program (CTEIP)</i>		
C. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
Department Program Adjustments. Increased investments for high-priority hypersonic ground and open air range test capability developments and increased investments for critically needed upgrades to DoD Threat Models and Simulations.				
Accomplishments/Planned Programs Subtotals		204.268	270.013	260.267
D. Other Program Funding Summary (\$ in Millions) N/A				
Remarks				
E. Acquisition Strategy N/A				
F. Performance Metrics A portion of CTEIP projects that were developed and delivered to the DoD test community over the past five years.				

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity	R-1 Program Element (Number/Name)											
0400: <i>Research, Development, Test & Evaluation, Defense-Wide / BA 6: RDT&E Management Support</i>	PE 0604942D8Z / <i>Assessments & Evaluations</i>											
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	177.443	48.985	31.285	30.834	-	30.834	23.228	23.547	23.974	24.213	Continuing	Continuing
805: <i>Assessments & Evaluations</i>	177.443	48.985	16.316	16.431	-	16.431	12.379	12.575	13.870	14.165	Continuing	Continuing
822: <i>Director, Special Programs (DSP)</i>	0.000	0.000	2.700	5.040	-	5.040	5.104	5.164	5.231	5.342	Continuing	Continuing
823: <i>National Assessment Group (NAG)</i>	0.000	0.000	12.269	9.363	-	9.363	5.745	5.808	4.873	4.706	Continuing	Continuing

A. Mission Description and Budget Item Justification

This program is reported in accordance with Title 10, United States Code, Section 119(a)(1) in the Special Access Program Annual Report to Congress. For further information, please contact the Director of Special Programs, OUSD(A&S)/DSP.

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	30.144	31.356	31.604	-	31.604
Current President's Budget	48.985	31.285	30.834	-	30.834
Total Adjustments	18.841	-0.071	-0.770	-	-0.770
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	20.000	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-1.101	-			
• FFRDC	-0.058	-0.071	-0.856	-	-0.856
• Organizational change adjustment	-	-	-7.914	-	-7.914
• Program Increase	-	-	8.000	-	8.000

Change Summary Explanation

FY 2018, congressional add
FY 2019, factored Economic Inflation
FY 2020, organizational reorg change

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 6					R-1 Program Element (Number/Name) PE 0604942D8Z / <i>Assessments & Evaluations</i>				Project (Number/Name) 805 / <i>Assessments & Evaluations</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
805: <i>Assessments & Evaluations</i>	177.443	48.985	16.316	16.431	-	16.431	12.379	12.575	13.870	14.165	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		
A. Mission Description and Budget Item Justification This program is reported in accordance with Title 10, United States Code, Section 119(a)(1) in the Special Access Program Annual Report to Congress. For further information, please contact the Director of Special Programs, OUSD(A&S)/DSP.												
B. Accomplishments/Planned Programs (\$ in Millions)									FY 2018	FY 2019	FY 2020	
Title: Assessments & Evaluations									48.985	16.316	16.431	
Description: Classified Program												
FY 2019 Plans: Detailed information is Classified.												
FY 2020 Plans: Detailed information is Classified.												
FY 2019 to FY 2020 Increase/Decrease Statement: Internal adjustments.												
Accomplishments/Planned Programs Subtotals									48.985	16.316	16.431	
C. Other Program Funding Summary (\$ in Millions) N/A Remarks												
D. Acquisition Strategy This is a RDT&E Management and Support effort and does not acquire any products.												
E. Performance Metrics N/A												

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
822: Director, Special Programs (DSP)	0.000	0.000	2.700	5.040	-	5.040	5.104	5.164	5.231	5.342	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		
A. Mission Description and Budget Item Justification Classified Program.												
B. Accomplishments/Planned Programs (\$ in Millions)									FY 2018	FY 2019	FY 2020	
Title: Director, Special Program FY 2019 Plans: Detailed information is Classified. FY 2020 Plans: Detailed information is Classified. FY 2019 to FY 2020 Increase/Decrease Statement: Internal adjustments.									-	2.700	5.040	
Accomplishments/Planned Programs Subtotals									-	2.700	5.040	
C. Other Program Funding Summary (\$ in Millions) N/A Remarks D. Acquisition Strategy N/A E. Performance Metrics NA												

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
823: National Assessment Group (NAG)	0.000	0.000	12.269	9.363	-	9.363	5.745	5.808	4.873	4.706	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification
Classified program.

<u>B. Accomplishments/Planned Programs (\$ in Millions)</u>	FY 2018	FY 2019	FY 2020
<i>Title:</i> National Assessment Group (NAG) <i>Description:</i> Detailed information is Classified. <i>FY 2019 Plans:</i> Detailed information is Classified. <i>FY 2020 Plans:</i> Detailed information is Classified. <i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> Internal adjustments.	-	12.269	9.363
Accomplishments/Planned Programs Subtotals	-	12.269	9.363

C. Other Program Funding Summary (\$ in Millions)
N/A

Remarks

D. Acquisition Strategy
N/A

E. Performance Metrics
NA

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity					R-1 Program Element (Number/Name)							
0400: Research, Development, Test & Evaluation, Defense-Wide / BA 6: RDT&E Management Support					PE 0605100D8Z / Joint Mission Environment Test Capability (JMETC)							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	190.108	90.326	88.184	83.091	-	83.091	79.125	80.181	84.532	85.762	Continuing	Continuing
087: JMETC Distributed Test	120.306	58.154	16.558	15.157	-	15.157	14.819	15.279	15.950	16.402	Continuing	Continuing
088: JMETC National Cyber Range (NCR) Complex	69.802	10.000	71.626	67.934	-	67.934	64.306	64.902	68.582	69.360	Continuing	Continuing
100: JMETC	-	22.172	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	91.057	84.184	83.091	-	83.091
Current President's Budget	90.326	88.184	83.091	-	83.091
Total Adjustments	-0.731	4.000	0.000	-	0.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	4.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.731	-			

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
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)	
Change Summary Explanation FY2019: Congressional add of +\$4M provided in Department of Defense Appropriation Bill (P.L. 115-245) accommodates a program increase, to include funding for cyber range capability and development. All additional funds included in Project 088 Joint Mission Environment Test Capability National Cyber Range (NCR) Complex.		

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
087: JMETC Distributed Test	120.306	58.154	16.558	15.157	-	15.157	14.819	15.279	15.950	16.402	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The JMETC distributed test mission is to provide the persistent and reusable enterprise T&E infrastructure necessary for effectively conducting Joint, interoperability, and system integration RDT&E on DoD warfighting capabilities. Building the required agile, multi-organizational test infrastructure to assess system-to-system interoperability, effectiveness, and resiliency is cost prohibitive for any single acquisition program. The JMETC Distributed Test capability reduces the cost to plan, setup, and execute these complex tests by delivering an enterprise-wide capability that incorporates persistent connectivity, common integration software for linking sites and live-virtual-constructive (LVC) test resources, accredited test tools, cybersecurity support, and distributed T&E expertise into a robust, operationally representative T&E mission environment. The JMETC Distributed Test project also provides its customers a support team to assist with JMETC capabilities and the execution of distributed test events. The JMETC Distributed Test project has also begun the task of modernizing DoD T&E knowledge management by introducing big data analytics tools and techniques as part of its enterprise capabilities. The JMETC Distributed Test project builds, maintains, and operates the JMETC infrastructure and pays for persistent availability of national connectivity for testing; data communications middleware; development of interface standards; common software tools and components; and a reuse repository. The JMETC Distributed Test project also provides program management, facilities, equipment, operating costs, and special studies and analysis related to distributed test capabilities and infrastructure. Ultimately, the JMETC Distributed Test project supports and advances experimentation, system engineering, acquisition, testing, training, and mission planning, aligned to the National Defense Strategy to build a more lethal force.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: JMETC Distributed Test	58.154	16.558	15.157	-	15.157
Description: - The JMETC Distributed Test project expanded the JMETC Secret Network (JSN) infrastructure to 82 functional sites. - 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-					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense			Date: February 2019				
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
submarine warfare; tactical radar systems; precision-guided bombs; unmanned aircraft; autonomous aircraft; manned fixed wing aircraft; helicopters; and business systems.							
- The JMETC Distributed Test project provided strategic planning efforts to engage new acquisition programs that must demonstrate compliance with Net-Ready Key Performance Parameter.							
- 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.							
- The JMETC Distributed Test project created a 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 2019 Plans:							
- The JMETC Distributed Test project will continue to optimize the JMETC Secret Network (JSN) infrastructure to meet requirements, adding an additional 8 sites.							
- 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 business 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.							

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense			Date: February 2019			
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
<p>- The JMETC Distributed Test project will expand post-test enterprise service capabilities, to include as Knowledge Management and Big Data Analytics tools and technologies, in support of JMETC customer needs and requirements.</p> <p>FY 2020 Base Plans:</p> <p>- The JMETC Distributed Test project will continue to optimize the JMETC Secret Network (JSN) infrastructure to meet requirements, adding or removing sites as necessary.</p> <p>- 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.</p> <p>- The JMETC Distributed Test project will continue providing test planning support to users and organizations to conduct interoperability testing on numerous DoD systems including: command and control systems; information warfare; air and missile defense; intelligence, surveillance, and sensor systems; surface ships; anti-surface warfare; anti-submarine warfare; tactical radar systems; precision-guided bombs; unmanned aircraft; autonomous aircraft; manned fixed wing aircraft; helicopters; and business systems.</p> <p>- 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.</p> <p>- The JMETC Distributed Test project will expand post-test enterprise service capabilities, to include as Knowledge Management and Big Data Analytics tools and technologies, in support of JMETC customer needs and requirements.</p> <p>- The JMETC Distributed Test project will support to new and emerging acquisition programs.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Program Adjustments</p>						
Accomplishments/Planned Programs Subtotals		58.154	16.558	15.157	-	15.157

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605100D8Z / <i>Joint Mission Environment Test Capability (JMETC)</i>	Project (Number/Name) 087 / <i>JMETC Distributed Test</i>
C. Other Program Funding Summary (\$ in Millions) N/A		
Remarks		
D. Acquisition Strategy N/A		
E. Performance Metrics <ul style="list-style-type: none">- Number of distributed test sites- Number of events conducted- Number of acquisition programs supported- Number of downloads from JMETC Repository		

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
088: JMETC National Cyber Range (NCR) Complex	69.802	10.000	71.626	67.934	-	67.934	64.306	64.902	68.582	69.360	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The National Cyber Range Complex (NCRC) is comprised of cyber ranges and a secure distributed network infrastructure to service the cyber range user community. The NCRC currently consists of five functional cyber ranges, including the National Cyber Range in Florida as well as four Regional Service Delivery Points (RSDP) located in Hawaii, Alabama, Maryland, and Massachusetts. To enhance DoD cyber range test and training capability and capacity, the NCRC is being expanded with additional cyber ranges co-located with key Service organizations to support an increase of cyber testing of DoD systems as well as training of cyber warfighters. The JMETC Multiple Independent Level of Security (MILS) Network (JMN) currently links 58 sites across the DoD, industry, and academia, providing secure access between cyber ranges, laboratories, and facilities. Both the cyber ranges and the network infrastructure are accredited to support multiple levels of security classifications, specifically configured to meet particular cyber event requirements. The NCRC investments have been aligned to support the National Defense Strategy in improving cyber defense, cyber resilience, and the continued integration of cyber capabilities into the full spectrum of military operations.

The NCRC conducts cyberspace test and training events for the full spectrum of DoD customers including research, development, acquisition, testing, training and operational Cyber Mission Forces (CMF). The NCRC executes wide variety of event types including science and technology (S&T) demonstrations, developmental test and evaluation (DT&E), operational test and evaluation (OT&E), security controls assessments, cyberspace operations training, refinement of cyberspace tactics, techniques, and procedures (TTP) Development, forensics/malware analysis) and cyberspace operations mission rehearsal. The NCRC enables acquisition programs to conduct cybersecurity test and evaluation in an operationally representative cyberspace environment enabling identification, validation and mitigation of vulnerabilities. The NCRC also supports training, mission rehearsal and certification of the CMF in support of US Cyber Command by enabling operational forces to efficiently evaluate cyber warfighting capability in a realistic joint mission environment.

The NCRC provides secure facilities, technology, processes, and workforce to rapidly create hi-fidelity, mission-representative friendly, neutral, and adversarial cyberspace environments.

The NCRC also facilitates integration of distributed organizations with different missions and workforce relevant to cyber operations (e.g., cyber operators, penetrations testers, cyber assessors, cyber observers, cyber analysts, etc.). The NCRC supports cyber activities across of a full spectrum of DoD systems, including weapon platforms, C4I systems, business systems, network devices, and other systems vulnerable to a cyber-attack. The NCRC extensively utilizes automation to minimize human error, to reduce the time required to set-up for a cyber event, and to ensure repeatable results. In addition, the NCRC employs post-event sanitization techniques on all assets after exposure to malicious code to restore back to a known, clean state, which allows for reuse in future events.

The NCRC has a multidisciplinary workforce with software, systems, network, virtualization, automation, system administration, and cybersecurity subject matter expertise. In support of successful planning and execution of hosted events, the NCRC workforce helps users define and refine their event objectives, assists with identifying and prioritizing potential vulnerabilities, designs virtualized cyber environments, develops customized traffic generation and instrumentation solutions,

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense				Date: February 2019		
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		
integrates 3rd party hardware and software, executes cyber events on behalf of the user, provides cooperative vulnerability and penetration assessments, performs detailed cyber analysis, and delivers detailed reports on the results. In addition, the NCRC workforce supports both the Executive Agent for Cyber Test Ranges and 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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: JMETC National Cyber Range (NCR) Complex		10.000	71.626	67.934	-	67.934
Description: - The NCRC supported hundreds to cyber events, providing cybersecurity T&E support to Major Defense Acquisition Programs (MDAP), Major Automated Information Systems (MAIS) Acquisition Programs, and smaller acquisition programs.						
- The NCRC supported cyber testing of systems and subsystems 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 supported Service Cyber Mission Forces (CMF) with training, certification, mission rehearsal and TTP development focused events.						
- The NCRC supported numerous DoD organizations in cyber activities, including US Cyber Command; Joint Staff J-7; Director, Operational Test & Evaluation (DOT&E); Director, Developmental Test & Evaluation (DT&E); Army PEO Command Control Communications Tactical (PEO C3T); Naval Air Systems Command (NAVAIR); Space and Naval Warfare Systems Command (SPAWAR); Naval Sea Systems Command (NAVSEA); PEO Ships; Air Force Space and Missile Command; Army Intelligence and Information Warfare Directorate; Office of Naval Intelligence; Marine Corps Tactical Systems Support Activity; the Army Communications and Electronics Research, Development and Engineering Command (CERDEC); and several partner nations.						
FY 2019 Plans:						
- The NCRC will continue to implement improvements needed to increase capacity and support increased demand at the current cyber ranges.						
- The NCRC will continue to build out additional dedicated Persistent Testing and Training Environments to support testing and training customers.						

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense				Date: February 2019		
Appropriation/Budget Activity 0400 / 6		R-1 Program Element (Number/Name) PE 0605100D8Z I Joint Mission Environment Test Capability (JMETC)		Project (Number/Name) 088 I JMETC National Cyber Range (NCR) Complex		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
<div>- The NCRC will continue to operate in support of the growing acquisition program cybersecurity T&E requirements.</div> <div>- 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.</div> <div>- 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.</div> <div>- The NCRC will continue to support DOT&E cyber assessments.</div> <div>- The NCRC will continue to support US Cyber Command cyber activities.</div> <div>- The NCRC will continue to expand testing of Industrial Control Systems and Avionics Systems test beds.</div> <div>- The NCRC will increase capacity by establishing additional cyber ranges in support of both cyber T&E and training requirements.</div> <div>- The NCRC will conduct engineering activities to plan for technical refresh of emerging end of life and end of service computing assets.</div> <div>- 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.</div> <div>- The NCRC will continue analyses of capability to determine requirements and standards needed to join these cyber test facilities with existing acquisition system hardware-in-the-loop, software-in-the-loop, and systems integration laboratories to test systems in a realistic cyber contested environment.</div> <div>- The NCRC will continue to expand the JMN connectivity as needed to provide access to cyber range resources.</div> <div>FY 2020 Base Plans:</div>						

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense				Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
<div>- The NCRC will continue to implement improvements needed to increase capacity and support increased demand at the current cyber ranges.</div> <div>- The NCRC will continue to build out additional dedicated Persistent Testing and Training Environments to support testing and training customers.</div> <div>- The NCRC will continue to operate in support of the growing acquisition program cybersecurity T&E requirements.</div> <div>- 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.</div> <div>- 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.</div> <div>- The NCRC will continue to support DOT&E cyber assessments.</div> <div>- The NCRC will continue to support US Cyber Command cyber activities.</div> <div>- The NCRC will increase capacity by establishing additional cyber ranges in support of both cyber T&E and training requirements.</div> <div>- The NCRC will conduct engineering activities to plan for technical refresh of emerging end of life and end of service computing assets.</div> <div>- 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.</div> <div>- The NCRC will continue analyses of capability to determine requirements and standards needed to join these cyber test facilities with existing acquisition system hardware-in-the-loop, software-in-the-loop, and systems integration laboratories to test systems in a realistic cyber contested environment.</div>						

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense				Date: February 2019	
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 2018	FY 2019
- The NCRC will continue to expand the JMN connectivity as needed to provide access to cyber range resources. FY 2019 to FY 2020 Increase/Decrease Statement: Program Adjustments					
Accomplishments/Planned Programs Subtotals				10.000	71.626
				67.934	-
C. Other Program Funding Summary (\$ in Millions)					
N/A					
Remarks					
D. Acquisition Strategy					
N/A					
E. Performance Metrics					
- Amount of increase in computing power - Number of events capable of supporting - Number of cyber ranges available					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 6					R-1 Program Element (Number/Name) PE 0605100D8Z / Joint Mission Environment Test Capability (JMETC)				Project (Number/Name) 100 / JMETC			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
100: JMETC	-	22.172	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The 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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: JMETC	22.172	0.000	0.000	0.000	0.000
Description: Due to the ever increasing cyber test requirements, the JMETC Program developed a strategy to expand cyber test range capabilities. The cyber test range expansion is being implemented in Project 88 in FY 2019. To ease the ability to track and monitor cyber test infrastructure investments, the JMETC projects were realigned and consolidated under Project 88: JMETC National Cyber Range (NCR) Complex.					
FY 2019 Plans: Activities realigned under Project 88: JMETC National Cyber Range (NCR) Complex. All cyber activities within the JMETC Program being executed under Project 88 in FY 2019.					
FY 2020 Base Plans: Activities realigned under Project 88: JMETC National Cyber Range (NCR) Complex.					
FY 2020 OCO Plans: N/A					
Accomplishments/Planned Programs Subtotals	22.172	0.000	0.000	0.000	0.000

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605100D8Z / <i>Joint Mission Environment Test Capability (JMETC)</i>	Project (Number/Name) 100 / <i>JMETC</i>
C. Other Program Funding Summary (\$ in Millions) N/A		
Remarks		
D. Acquisition Strategy Activities realigned under Project 88: JMETC National Cyber Range (NCR) Complex.		
E. Performance Metrics Activities realigned under Project 88: JMETC National Cyber Range (NCR) Complex.		

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

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
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	153.308	21.575	22.525	18.079	-	18.079	18.255	18.666	19.002	19.003	Continuing	Continuing
421: Technical Studies	153.308	21.575	22.525	18.079	-	18.079	18.255	18.666	19.002	19.003	Continuing	Continuing

A. Mission Description and Budget Item Justification

This program is a key source of funding for the Office of the Secretary of Defense and the Joint Staff 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 emerging advanced security threats in the current geopolitical environment, the need for objective analysis and forward looking planning to inform senior leadership for the mid and long-term is vital to remaining strategically competitive.

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	22.386	22.576	18.757	-	18.757
Current President's Budget	21.575	22.525	18.079	-	18.079
Total Adjustments	-0.811	-0.051	-0.678	-	-0.678
• Congressional General Reductions	0.000	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.768	-			
• FFRDC reduction	-0.043	-0.051	-	-	-
• Budget Realignment to Chemical Biological Defense Program	-	-	-0.678	-	-0.678

Change Summary Explanation

Reductions are reflected for general program reductions and realignments.

As part of the Department of Defense reform agenda, the budget estimate reflects a stable trend in the number and cost of reports and studies in the near-term.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 6					R-1 Program Element (Number/Name) PE 0605104D8Z / <i>Technical Studies Support and Analysis</i>				Project (Number/Name) 421 / <i>Technical Studies</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
421: <i>Technical Studies</i>	153.308	21.575	22.525	18.079	-	18.079	18.255	18.666	19.002	19.003	Continuing	Continuing
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) and the Joint Staff 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 advanced emerging security threats in the current geopolitical environment, the need for objective analysis and forward looking planning to inform senior leadership for the mid and long-term is vital to remaining strategically competitive.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
Title: Technical Studies and Analyses Support for the Office of the Secretary of Defense (OSD)	21.575	22.525	18.079
FY 2019 Plans: Technical Support for the USD(Acquisition and Sustainment): Studies and analyses of: Electromagnetic spectrum battle management, technological capabilities requirements planning, nuclear forensics capabilities, countering short-range missile threats, munitions portfolio requirements, strategic communications capabilities, strategic materials industrial infrastructure, space systems requirements, macroeconomic impacts on the defense industrial base, defense manufacturing requirements, cyber assurance, supply chain risk management, global defense industry developments, international armaments cooperation, strategic basing requirements, acquisition data management capabilities, DoD installations planning, and improving integration of the acquisition process with operational needs. Technical Support for the Director, Cost Assessment and Program Evaluation: Studies and analyses regarding the following areas:			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605104D8Z / <i>Technical Studies Support and Analysis</i>	Project (Number/Name) 421 / <i>Technical Studies</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>Various analytic requirements for promoting an effective force with increased lethality such as developing plans for force modernization, sustainment of the nuclear stockpile and strategic forces, modernization of nuclear infrastructure, force projection capabilities, strategic cyber defense, maintaining full spectrum conventional and unconventional capabilities, capability planning resulting from scenario analyses, technical studies and analyses to support independent cost estimates and economic research, and continuation of development of critical management instruments for measuring the long-term trends, strength and affordability of the defense program and supporting development of the Future Years Defense Program.</p> <p>Technical Support for the USD(Policy): Studies, analyses, and activities in the following areas:</p> <p>Requirements regarding national security geopolitical posture and policies such as regional defense strategies, defense against biological warfare and pandemics, strengthening regional defense partnerships and alliances, strategic defense policy, detection and defense against weapons of mass destruction, counter proliferation policy, global health security capabilities, eliminating terrorist safe havens and transnational terrorist organizations, space and cyber strategic guidance planning, strategic implications of global energy trends, homeland defense capabilities, and strategic-level simulations of areas of interest for legislative and executive branch decision-makers.</p> <p>Technical Support for the USD(Personnel & Readiness): Studies and analyses in the following areas:</p> <p>Strengthening close combat capabilities, sustainment and planning for the force of the future such as active and reserve recruiting and retention issues, training requirements, maintaining strategic readiness, compensation and quality of life matters and retention, identifying critical personnel requirements, reserve component readiness and sustainability, health and medical issues, crisis and contingency readiness, diversity management and equal opportunity, and strategies for managing the Total Force portfolio.</p> <p>Technical Support for the Joint Staff conducting joint research with OSD:</p> <p>Joint Studies and analyses with OSD based upon operations research, intelligence capabilities, command and control requirements, mobility capabilities, supply chain and support requirements, joint testing and training requirements, civil support capabilities, force programming planning, and basing requirements.</p> <p>FY 2020 Plans: Technical Support for the USD(Acquisition and Sustainment):</p>			
			FY 2020

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605104D8Z / <i>Technical Studies Support and Analysis</i>	Project (Number/Name) 421 / <i>Technical Studies</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>Studies and analyses of:</p> <p>Readiness of major weapons systems, industrial base assurance for critical munitions, strategic platform capabilities, software development and sustainment capabilities, countering weapons of mass destruction, autonomous systems, space systems requirements, advanced manufacturing requirements, electronic warfare capabilities, global defense industry developments, strategic basing requirements, strengthening allied defense capabilities, DoD installations planning, supply chain and energy resiliency, and small business technology investment and acquisition strategy.</p> <p>Technical Support for the Director, Cost Assessment and Program Evaluation: Studies and analyses regarding the following areas:</p> <p>Various analytic requirements for maintaining a balanced portfolio of defense capabilities through investment and resource planning such as emerging strategic and tactical systems requirements, developing innovative operational concepts, joint lethality in contested environments, mobility and logistical support capabilities, maintaining force readiness and personnel planning requirements, capability planning resulting from scenario analyses, contingency and conventional force requirements, technical studies and analyses to support independent cost estimates and economic research, and continuation of development of critical management instruments for measuring the long-term trends, strength and affordability of the defense program and supporting development of the Future Years Defense Program.</p> <p>Technical Support for the USD(Policy): Studies, analyses, and activities in the following areas:</p> <p>Requirements regarding national security geopolitical posture and policies such as regional and strategic defense strategy, countering weapons of mass destruction, global strategic affairs, defense capabilities continuity, countering coercion and subversion, homeland defense support of civil authorities, planning, technological and other external effects on strategic requirements, space and cyber strategic guidance planning, protection of defense critical infrastructure, contingency and stability operations, nuclear planning, and strategic-level simulations of areas of interest for legislative and executive branch decision-makers.</p> <p>Technical Support for the USD(Personnel & Readiness): Studies and analyses in the following areas:</p> <p>Rebuilding readiness, sustainment and planning for the force of the future such as active and reserve recruiting and retention issues, training requirements, maintaining strategic force depth, compensation and quality of life matters and retention,</p>			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605104D8Z / <i>Technical Studies Support and Analysis</i>	Project (Number/Name) 421 / <i>Technical Studies</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>identifying critical personnel requirements, reserve component readiness and sustainability, health and medical issues, crisis and contingency readiness, diversity management and equal opportunity, and strategies for managing the Total Force portfolio.</p> <p>Technical Support for the Joint Staff conducting joint research with OSD:</p> <p>Joint Studies and analyses with OSD based upon operations research, cyber capabilities, command and control requirements, dynamic force employment, logistical resilience, joint testing and training requirements, homeland defense, force programming planning, and adaptive basing capabilities.</p> <p><i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> Decrease reflects general program changes and changes in requirements due to OSD reorganization. FY 2019 plans reflect the transition of certain functions from the USD(Acquisition, Technology and Logistics) to the USD(Acquisition and Sustainment) and transfer of support for the Defense Science Board to the Under Secretary of Defense (Research and Engineering).</p>			
Accomplishments/Planned Programs Subtotals		21.575	22.525
C. Other Program Funding Summary (\$ in Millions)			
N/A			
Remarks			
D. Acquisition Strategy			
N/A			
E. Performance Metrics			
FY 2020 BA: \$18.079 FY 2020 BA Assoc w/Metrics: \$18.079 Percent FY 2020 BA Assoc w/Metrics: 100%			
<p>This program supports approximately seventy-five studies per fiscal year performed by a variety of commercial, non-profit, and government research sources. Research supports a wide variety of national security goals of the Department and is designed to encourage a collaborative research approach among the components of OSD and the Joint Staff. The research and study projects supported by this program are closely integrated with the strategic goals of the Department of Defense. The focus of studies varies across a wide spectrum including weapons systems cost analysis, strengthening and leveraging alliances, human resource and military personnel management, examination of innovative technologies, application of technology to operational doctrine, and many other issues of emerging importance. Most of the actions are long to intermediate-range in outlook, and the program allows organizational leaders to plan and guide their research toward meeting their highest-priority goals and other high-level guidance such as executive branch performance management objectives and the National Defense Strategy of the United States of America.</p>			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605104D8Z / <i>Technical Studies Support and Analysis</i>	Project (Number/Name) 421 / <i>Technical Studies</i>
<p>In following the program efficiencies guidance of the Secretary of Defense, the scope of studies and analyses has been limited as necessary in order to focus upon issues of the highest strategic importance and needs to the Department of Defense while sustaining efforts to support requirements for the Office of the Secretary of Defense developing from legislative direction.</p>		

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense										Date: March 2019		
Appropriation/Budget Activity					R-1 Program Element (Number/Name)							
0400: Research, Development, Test & Evaluation, Defense-Wide / BA 6: RDT&E Management Support					PE 0605128D8Z / Classified Program							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	632.215	138.494	103.000	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
128: Classified Program	632.215	138.494	103.000	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

N/A

A. Mission Description and Budget Item Justification

Classified

B. Program Change Summary (\$ in Millions)

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	0.000	0.000	0.000	-	0.000
Current President's Budget	138.494	103.000	0.000	-	0.000
Total Adjustments	138.494	103.000	0.000	-	0.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	138.494	103.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			

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

Project: 128: Classified Program

Congressional Add: Classified

	FY 2018	FY 2019
	138.494	103.000
Congressional Add Subtotals for Project: 128	138.494	103.000
Congressional Add Totals for all Projects	138.494	103.000

Change Summary Explanation

N/A

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense		Date: March 2019	
Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I</i> BA 6: <i>RDT&E Management Support</i>		R-1 Program Element (Number/Name) PE 0605128D8Z / <i>Classified Program</i>	

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019
<i>Congressional Add:</i> Classified	138.494	103.000
<i>FY 2018 Accomplishments:</i> Classified		
<i>FY 2019 Plans:</i> Classified		
Congressional Adds Subtotals	138.494	103.000

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

N/A

Remarks

N/A

E. Acquisition Strategy

N/A

F. Performance Metrics

None

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity	R-1 Program Element (Number/Name)											
0400: <i>Research, Development, Test & Evaluation, Defense-Wide / BA 6: RDT&E Management Support</i>	PE 0605142D8Z / <i>Systems Engineering</i>											
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	218.709	36.313	38.784	37.140	-	37.140	41.606	33.842	34.701	35.564	Continuing	Continuing
142: <i>Systems Engineering</i>	193.309	32.506	32.914	35.140	-	35.140	39.606	31.842	32.701	33.564	Continuing	Continuing
143: <i>Program Protection</i>	25.400	3.807	3.870	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
842: <i>Mission Engineering</i>	0.000	0.000	2.000	2.000	-	2.000	2.000	2.000	2.000	2.000	Continuing	Continuing

A. Mission Description and Budget Item Justification

This Program Element (PE) establishes the dedicated funding line to carry out the mission and systems engineering duties as described in Deputy Secretary of Defense Memorandum, "Establishment of the Office of the Under Secretary of Defense for Research and Engineering and the Office of the Under Secretary of Defense for Acquisition and Sustainment," July 13, 2018. The Director, Mission Engineering (D, ME) and Director, Systems Engineering under the Deputy Director, Mission Engineering & Integration (DD, ME&I) are the principal advisors to the Secretary of Defense and the Under Secretary of Defense for Research and Engineering (USD(R&E)) on systems engineering, development planning, and related technical fields in the Department of Defense (DoD). The DD, ME&I develops policies and guidance for: (1) the use of systems engineering principles and best practices; (2) the use of systems, and software engineering planning and contracting approaches to enhance manufacturing, reliability, availability and maintainability on major defense acquisition programs (MDAPs); (3) the systems engineering plans (SEPs) for MDAPs including software, and systems engineering considerations in support of lifecycle management and sustainment; and (4) the inclusion of provisions relating to systems engineering and reliability in requests for proposals. The DD, ME&I develops new methods, processes, and tools (MPTs) incorporating state of the practice into engineering for the DoD in both weapon system design, and design tools. The DD, ME&I reviews and approves the SEP for each MDAP, and monitors and reviews the systems engineering and development planning activities of MDAPs and other defense acquisition programs, as directed by the Secretary of Defense. Based on the DD, ME&I's continuous program engagement, the DD, ME&I advises and makes recommendations to the Secretary of Defense regarding systems engineering, development planning, reliability and maintainability (R&M) engineering planning, and the execution of these activities. As a member of the Defense Acquisition Board (DAB), the DD, ME&I provides independent assessments of defense acquisition program's systems engineering, development planning, technical execution, and risk. The DD, ME&I also provides input on the inclusion of systems engineering requirements as part of the Joint Requirements Oversight Council's process for joint military requirements (e.g. the Sustainment Key Performance Parameter), to include developing specific inputs relating to each capabilities development document.

In alignment with the National Defense Strategy (NDS), the Systems Engineering (SE) Program Element 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 AORs, and determine revised system, architectural, tech surprise opportunities to maintain tactical edge, insert technology, improve interoperability and formulate long-term strategies to retain or improve our capabilities against our adversaries. The SE Program Element oversees, initiates, or recommends opportunities to align technology investments to accelerate capability delivery, or modification of existing systems. SE Program Element supports modernizing key capabilities and cultivating workforce talent by developing SE methods, policies, processes, and tools that cross cuts technologies and integrates technical disciplines to advance DoD engineering practices and providing advocacy and oversight for the Department's systems engineering workforce to build a capable, current, and innovative engineering workforce. The SE Program Element also supports reforming the Department for greater performance and affordability by conducting independent technical risk assessments (ITRAs) on MDAPs to advise the USD(R&E) on progress towards achieving key performance parameters, technology maturation, interoperability, and cyber security posture.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide / BA 6:</i> <i>RDT&E Management Support</i>	R-1 Program Element (Number/Name) PE 0605142D8Z / <i>Systems Engineering</i>
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The DD, ME&I issues guidance to, and consults with, the Services and Agencies with respect to systems engineering across the Department. The DD, ME&I improves DoD's SE capabilities through advocacy, oversight, policy, and guidance for the acquisition workforce responsible for Engineering, and Production, Quality & Manufacturing (PQM); in Engineering Tools and Environments; and in Specialty Engineering.

The DD, ME&I periodically reviews the organizations and capabilities of the military departments with respect to systems engineering, development planning, and lifecycle management and sustainability, and identifies needed changes or improvements to such organizations and capabilities.

Beginning in FY 2019, this PE will support activities to carry out responsibilities described in Fiscal Year 2017 National Defense Authorization Act (NDAA) Section 855 titled Mission Integration Management (MIM).

Funding from Project Code 143, Program Protection, will be re-aligned to a new Maintaining Technology Advantage Program Element (PE) 0605797D8Z, beginning in FY 2020 to support efforts which have transitioned to the Deputy Director, Strategic Technology Protection and Exploitation (STP&E).

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	37.622	38.872	39.252	-	39.252
Current President's Budget	36.313	38.784	37.140	-	37.140
Total Adjustments	-1.309	-0.088	-2.112	-	-2.112
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-1.236	-			
• FFRDC Reduction	-0.073	-0.088	-	-	-
• Other Program Adjustments	-	-	-2.112	-	-2.112

Change Summary Explanation

In FY 2020, funding was re-aligned to the Maintaining Technology Advantage PE0605797D8Z; changes were made in accordance with new OUSD(R&E) re-organization.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 6					R-1 Program Element (Number/Name) PE 0605142D8Z / <i>Systems Engineering</i>				Project (Number/Name) 142 / <i>Systems Engineering</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
142: <i>Systems Engineering</i>	193.309	32.506	32.914	35.140	-	35.140	39.606	31.842	32.701	33.564	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Project P142 supports the execution of the missions of the Deputy Director, Mission Engineering & Integration (DD, ME&I) to: (1) provide flexible engineering policy, guidance, and workforce development requirements for the DoD acquisition workforce; (2) foster an acquisition environment of collaboration, teamwork, and joint ownership of program success through a proactive program oversight process, ensuring appropriate levels of systems engineering discipline are applied through all phases of the acquisition life cycle; and (3) engage all stakeholders across government, industry, and academia to collectively advance systems engineering practices and achieve acquisition excellence. The outcome of this effort is to ensure systems engineering principles and disciplines are modern, and fully accepted and assimilated into the DoD acquisition workforce positioning the DoD for acquisition excellence and leading to a stronger national defense.

Activities include the following functions:

- Work with acquisition program managers to prepare systems engineering plans (SEPs) to document the technical management approach.
- Conduct periodic program engagements in support of technical reviews to confirm programs are executed in accordance with the SEP.
- Review all aspects of the systems engineering process for major defense acquisition programs (MDAPs) to ensure they are adequate to support fielding and the achievement of cost, performance, and readiness goals including producibility, reliability, maintainability, sustainment, and other considerations.
- Participate in Systems Engineering Integrated Project Teams (IPTs), Systems Engineering Working Integrated Project Teams (WIPTs), and Systems Engineering technical reviews, especially Preliminary Design Reviews and Critical Design Reviews.
- Work with DoD Service program managers, their staffs, and other organizations, technical authorities, and oversight organizations to develop and implement technical management programs for MDAPs.
- Conceive plans and lead program support reviews and assessments of MDAP weapons systems and other programs to shape technical planning and management to ensure program success.
- Conduct other technical reviews as requested (e.g., Nunn-McCurdy certification reviews, Non-Advocate Reviews, focused technical assessments, and software readiness reviews to identify and mitigate program risk).
- Establish engineering policy, guidance, and workforce development to drive the development of fully capable and supportable weapons systems.
- Oversee Component implementation of engineering initiatives and conduct independent assessments. Advance the principles of modularity and open systems and incorporate them, when practicable in the design, and acquisition of weapon systems.
- Develop education and training materials for instructing, maintaining, and enhancing the defense acquisition workforce. Activities include: (1) developing guidance to enhance Engineering (ENG) and Production Quality and Manufacturing (PQM) 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 (e.g., reliability & maintainability, human-systems integration, weapons safety, value engineering and manufacturing) through policy, program oversight, fostering practice and technology improvements, initiating long-term strategic improvements, and collaborating with industry.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense			Date: February 2019		
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605142D8Z / <i>Systems Engineering</i>	Project (Number/Name) 142 / <i>Systems Engineering</i>	<ul style="list-style-type: none"> • Advance DoD engineering practices through the use of new MPTS, such as digital engineering and model-based systems engineering, for development of weapon systems. • Serve as the Defense Standardization Executive and oversee the Defense Standardization Program. • Guide Service and other component organizations in the development planning process to ensure proposed MDAP programs are executable within acceptable levels of risk. • Resolve long-term major systems engineering challenges such as systems of systems (SoS) systems engineering, systems engineering of complex systems, and pre-program formulation systems engineering trade off analysis. 		
B. Accomplishments/Planned Programs (\$ in Millions)			FY 2018	FY 2019	FY 2020
Title: Systems Engineering Initiatives Description: The DD, ME&I provides objective assessments of program risk to support knowledge-based decision making by DoD leaders regarding DoD MDAPs. FY 2019 Plans: Strategic Thrust: Program Support <ul style="list-style-type: none"> • Monitor programs, providing SE oversight and support to all MDAPs and special interest programs. • Expand root cause analysis conducted during and after Independent Technical Risk Assessments (ITRAs). • Expand use of detailed performance measurement and analysis. • Provide decision-quality information and recommendations to DABs, In Progress Reviews, Peer Reviews, and PDR/CDR assessments. Strategic Thrust: Work Force Development <ul style="list-style-type: none"> • Carry out duties as Functional Lead for Engineering (ENG), Production, Quality, and Manufacturing (PQM), all Department non-construction engineering and assist software engineering. • Build an enduring high performance engineering culture across the Department in Systems Engineering. • Update and deploy courses with increased technical rigor and complex, case-based exercises. • Investigate workforce development initiatives including leadership development, specialized training, and improved instructional methods. • Assess engineering workforce capability and capacity, and, working with Components, develop strategies to address identified gaps. • Perform outreach to services and OSD to focus the Department's attention and behavior on promoting an engineering culture. Strategic Thrust: Engineering Policy and Guidance <ul style="list-style-type: none"> • Develop and update core SE policy, guidance and standards; review all acquisition policy for SE implications. • Develop engineering guidance and policies for SE responsibility in the acquisition process including, but not limited to, software modeling and simulation; configuration management; data management; and risk management. 			32.506	32.914	35.140

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense			Date: February 2019		
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 2018	FY 2019	FY 2020
<ul style="list-style-type: none">Assess challenges and impact; develop new guidance, best practices, methods, processes and tools to more effectively implement SE for Systems of Systems.Provide guidance to Defense acquisition programs for developing and documenting each program's technical strategy and management approach in the SEP throughout the program's lifecycle. <p>Strategic Thrust: Specialty Engineering</p> <ul style="list-style-type: none">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 of MPT to identify challenges and opportunities and develop and promulgate best practices and guidance for applying specialty engineering principles, concepts, and practices in defense acquisition programs.Conduct activities to develop and implement plans to enhance the specialty engineering workforce. <p>Strategic Thrust: Systems Engineering Capabilities Assessment</p> <ul style="list-style-type: none">Work jointly with DT&E to develop and track measurable performance criteria.Develop and strengthen component SE organization and capabilities.Periodically review the organizations and capabilities of the Military Departments and Defense Agencies with respect to systems engineering, development planning, and lifecycle management and sustainability, and identify needed changes or improvements to such organizations and capabilities.Issue guidance to and consult with the Heads of the DoD Components with respect to systems engineering and development planning in the DoD.Store and analyze performance criteria from MDAP SEPs and test documentation; develop program metrics to aid SE assessments and program execution. <p>Strategic Thrust: Early Systems Engineering and Development Planning</p> <ul style="list-style-type: none">Perform early acquisition risk assessment including pre-MS A engagement with Joint Requirements Oversight Council processes.Support: (1) Services and COCOMs in pre-MS A formulation; (2) requirements analyses and analysis of alternatives; and (3) initial capabilities document definition and development. <p>Strategic Thrust: Engineering Tools and Environments</p> <ul style="list-style-type: none">Support implementation of digital engineering principles, concepts and practices into the activities of the DoD related to all aspects of weapon system lifecycle and use.Establish guidance and education to support digital engineering use in Systems Engineering.Normalize the separate concepts of digital engineering, modeling and simulation, and model-based/model-centric items into a cohesive enabler for national defense system lifecycle activities.					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense			Date: February 2019		
Appropriation/Budget Activity 0400 / 6		R-1 Program Element (Number/Name) PE 0605142D8Z / <i>Systems Engineering</i>		Project (Number/Name) 142 / <i>Systems Engineering</i>	
B. Accomplishments/Planned Programs (\$ in Millions)			FY 2018	FY 2019	FY 2020
<ul style="list-style-type: none"> • Continue collaboration in digital engineering methods, processes, tools development and gap identification to initiate research and development of gap filling technologies and methods. • Oversee the collaborative development of comprehensive guidance for proper identification of modular and open enablers; and effective use of such in the lifecycle activities of national defense systems. • Oversee development of, and incorporation of modularity and open system technical enablers by Services in their acquisition efforts. <p>FY 2020 Plans: FY 2020 Plans: Continue to: Strategic Thrust: Program Support</p> <ul style="list-style-type: none"> • Monitor programs, providing SE oversight and support to all MDAPs and special interest programs. • Expand root cause analysis conducted during and after Independent Technical Risk Assessments (ITRAs). • Expand use of detailed performance measurement and analysis. • Provide decision-quality information and recommendations to DABs, In Progress Reviews, Peer Reviews, and PDR/CDR assessments. <p>Strategic Thrust: Work Force Development</p> <ul style="list-style-type: none"> • Carry out duties as Functional Lead for Engineering (ENG), Production, Quality, and Manufacturing (PQM), all Department non-construction engineering and assist software engineering. • Build an enduring high performance engineering culture across the Department in Systems Engineering. • Update and deploy courses with increased technical rigor and complex, case-based exercises. • Investigate workforce development initiatives including leadership development, specialized training, and improved instructional methods. • Assess engineering workforce capability and capacity, and, working with Components, develop strategies to address identified gaps. • Perform outreach to services and OSD to focus the Department's attention and behavior on promoting an engineering culture. <p>Strategic Thrust: Engineering Policy and Guidance</p> <ul style="list-style-type: none"> • Develop and update core SE policy, guidance and standards; review all acquisition policy for SE implications. • Develop engineering guidance and policies for SE responsibility in the acquisition process including, but not limited to, software modeling and simulation; configuration management; data management; and risk management. • Assess challenges and impact; develop new guidance, best practices, methods, processes and tools to more effectively implement SE for Systems of Systems. 					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense			Date: February 2019		
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 2018	FY 2019	FY 2020
<ul style="list-style-type: none">• Provide guidance to Defense acquisition programs for developing and documenting each program’s technical strategy and management approach in the SEP throughout the program’s lifecycle. <p>Strategic Thrust: Specialty Engineering</p> <ul style="list-style-type: none">• 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 of MPT to identify challenges and opportunities and develop and promulgate best practices and guidance for applying specialty engineering principles, concepts, and practices in defense acquisition programs.• Conduct activities to develop and implement plans to enhance the specialty engineering workforce. <p>Strategic Thrust: Systems Engineering Capabilities Assessment</p> <ul style="list-style-type: none">• Work jointly with DT&E and DD, STP&E to develop and track measurable performance criteria.• Develop and strengthen component SE organization and capabilities.• Periodically review the organizations and capabilities of the Military Departments and Defense Agencies with respect to systems engineering, development planning, and lifecycle management and sustainability, and identify needed changes or improvements to such organizations and capabilities.• Issue guidance to and consult with the Heads of the DoD Components with respect to systems engineering and development planning in the DoD.• Store and analyze performance criteria from MDAP SEPs and test documentation; develop program metrics to aid SE assessments and program execution. <p>Strategic Thrust: Early Systems Engineering and Development Planning</p> <ul style="list-style-type: none">• Perform early acquisition risk assessment including pre-MS A engagement with Joint Requirements Oversight Council processes.• Support: (1) Services and COCOMs in pre-MS A formulation; (2) requirements analyses and analysis of alternatives; and (3) initial capabilities document definition and development. <p>Strategic Thrust: Engineering Tools and Environments</p> <ul style="list-style-type: none">• Support implementation of digital engineering principles, concepts and practices into the activities of the DoD related to all aspects of weapon system lifecycle and use.• Establish guidance and education to support digital engineering use in Systems Engineering.• Normalize the separate concepts of digital engineering, modeling and simulation, and model-based/model-centric items into a cohesive enabler for national defense system lifecycle activities.					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense			Date: February 2019		
Appropriation/Budget Activity 0400 / 6		R-1 Program Element (Number/Name) PE 0605142D8Z / <i>Systems Engineering</i>		Project (Number/Name) 142 / <i>Systems Engineering</i>	
B. Accomplishments/Planned Programs (\$ in Millions)			FY 2018	FY 2019	FY 2020
<ul style="list-style-type: none"> • Continue collaboration in digital engineering methods, processes, tools development and gap identification to initiate research and development of gap filling technologies and methods. • Oversee the collaborative development of comprehensive guidance for proper identification of modular and open enablers; and effective use of such in the lifecycle activities of national defense systems. • Oversee development of, and incorporation of modularity and open system technical enablers by Services in their acquisition efforts. • Support the development of the DoD PNT Open Architecture Standard (PNTAS) to version 1.0, and develop a virtual system integration laboratory (vSIL), as well as a PNT Fusion Module. The PNTAS v1.0 will be improved by a technical working group, on implementation on a service pathfinder, such as MAPS, EGI-M, and GPNTS. The vSIL will include development of CONOPS, a development environment, trade studies, and web server development. The PNT Fusion Module development will entail the creation of the physical system architecture based on the PNTAS, and evaluation and modification of Scorpion Code to comply with PNTAS. 					
FY 2019 to FY 2020 Increase/Decrease Statement: Level of effort is consistent between FY 2019 and FY 2020. Small changes reflect minor budget fluctuations.					
Accomplishments/Planned Programs Subtotals			32.506	32.914	35.140
C. Other Program Funding Summary (\$ in Millions)					
N/A					
Remarks					
D. Acquisition Strategy					
N/A					
E. Performance Metrics					
Improved the Systems Engineering effectiveness of the Department's acquisition enterprise and provided Department leadership with technical insights into acquisition program performance through: <ul style="list-style-type: none"> • Systems engineering plans (SEPs) reviewed and approved to document each program's technical management approach. • Independent Technical Risk Assessments (ITRAs) and periodic program engagements conducted and program technical reviews supported to confirm programs are executed in accordance with the SEP. • Technical reviews conducted as requested (e.g., Nunn-McCurdy certification reviews, Non-Advocate Reviews, and focused technical assessments to identify and mitigate program risk). • DABs, Overarching Integrated Product Teams (OIPTs), and other program review participation to provide technical insights to OSD stakeholders. • Effective systems engineering policy and guidance established and promulgated throughout the Military Services and the Defense Acquisition System. • A systems engineering workforce staffed, trained and certified with capable and experienced personnel. 					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605142D8Z / <i>Systems Engineering</i>	Project (Number/Name) 142 / <i>Systems Engineering</i>
<ul style="list-style-type: none">• Improved reliability engineering, reliability growth management, and reliability monitoring in program development contracting, execution and sustainment.• Service and other component organizations engaged and supported in the development planning process through effective policy, guidance, document reviews and program engagement to ensure proposed MDAP programs are executable within acceptable levels of risk.• Increased use of digital artifacts in acquisition decision making and expansion of design options.• Increased use of modular designs and design techniques in weapon systems, coupled with appropriate contracting language and follow through.		

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 6					R-1 Program Element (Number/Name) PE 0605142D8Z / <i>Systems Engineering</i>				Project (Number/Name) 143 / <i>Program Protection</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
143: <i>Program Protection</i>	25.400	3.807	3.870	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This program element supports the program protection activities of the Deputy Director, Strategic Technology Protection and Exploitation (DD, STP&E). The Department of Defense (DoD) must address cybersecurity and supply chain risks to DoD networks, weapons systems, and information stored and processed on both DoD and Defense Industrial Base (DIB) unclassified contractor information networks that support DoD programs. Increased reliance on the internet as a vehicle for sharing information, globalization of the supply chain, and advanced persistent threats (APTs) that can evade commercially available security tools and defeat generic security best practices, drives the need for diligent program protection planning and execution. Program Protection Planning includes protection of classified and unclassified controlled technical information, critical program information, critical components and critical mission functions, and integrates high level security policies and practical expertise to specific acquisition and S&T practices, systems engineering activities, and risk reduction activities. Through this initiative the Department is maturing system security engineering methodologies to protect controlled unclassified information, to include controlled technical information on contractor information networks; improve mitigation and management of supply chain risk management risks, improve integration of cybersecurity into the engineering processes, improve software assurance practices, mature processes to identify and protect Critical Program Information and improve program protection planning. Activities carried out, support implementation of DoD Instruction 5200.44 Trusted Systems and Networks with the use of proven mitigation techniques and tools, the ongoing refinement of risk management processes, and creation of needed technology; implementation of DoD Instruction 5200.39 Critical Program Information (CPI) Identification and Protection Within Research, Development, Test, and Evaluation (RDT&E) to identify and protect Critical Program Information; and implementation of DoD Instruction 8582.01 Security of Unclassified DoD Information on Non-DoD Information Systems for Safeguarding Controlled Unclassified Information on contractor owned networks.

DD, STP&E provides independent assessments of research, technology and defense acquisition program's system security engineering and program protection implementation.

The DD, STP&E reviews and approves the PPP for each MDAP, and monitors and reviews the system security engineering planning activities of MDAPs and other defense acquisition programs, as directed by the Secretary of Defense.

This PE includes efforts by the office of the DD, STP&E in implementing the Department's Trusted Defense System Strategy. Specifically, the PE will develop and mature the critical sub discipline of systems engineering - system security engineering (SSE), Hardware and Software Assurance, and the Comprehensive Program Protection Planning process that implements a risk-based approach to protection of critical program information, critical components and mission functions, and information in acquisition programs. These efforts include study and maturation of policy, guidance, system security discipline fundamentals, such as engineering methods, tools, and best practices, and establishing a coalition of assurance activities across the DoD to provide analytical and technical support to acquisition programs. These activities will be promulgated in defense acquisition as a fundamental element of the DD, STP&E systems engineering and technical reviews.

In FY 2020, funding from this project will transfer to the Maintaining Technology Advantage PE 0605797D8Z, in alignment with the DD, STP&E mission.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605142D8Z / <i>Systems Engineering</i>	Project (Number/Name) 143 / <i>Program Protection</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
Title: Program Protection		3.807	3.870
Description: The project provides system security engineering policy, guidance and objective assessments to reduce risks in sharing and storing Controlled Technical Information, improve mitigation of supply chain risk management risks, improve integration of cybersecurity into the engineering processes, integrate defense exportability and anti-tamper practices, mature processes to identify Critical Program Information and improve program protection planning. Activities carried out support implementation of DoD Instruction 5200.44 Trusted Systems and Networks with the use of proven mitigation techniques and tools, the ongoing refinement of risk management processes; implementation of DoD Instruction 5200.39 Critical Program Information (CPI) Identification and Protection Within Research, Development, Test, and Evaluation (RDT&E) to identify and protect Critical Program Information; and implementation of DoD Instruction 8582.01 Security of Unclassified DoD Information on Non-DoD Information Systems for Safeguarding Controlled Unclassified Information on contractor owned networks.			-
FY 2019 Plans:			
<ul style="list-style-type: none"> • Provide support to Independent Cyber Vulnerability Review Assessment teams in conduct of broad program protection planning activities to assess: <ul style="list-style-type: none"> - Conduct of criticality analyses to determine capability, systems and technology vulnerabilities. - Conduct Program Protection planning activities, and track progress to verify protection of critical program capabilities and technologies. • Advance the state of the practice of systems security engineering: <ul style="list-style-type: none"> - Continue development of methodology to identify and mitigate system security risk, to include cybersecurity 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 Technical Information and technology: <ul style="list-style-type: none"> - Refine implementation and guidance of marking and dissemination of distribution of technical information - Develop and refine safeguarding information protection methods for contractor unclassified information networks. 			
FY 2019 to FY 2020 Increase/Decrease Statement:			
Level of effort is consistent between FY 2019 and FY 2020. Small changes reflect minor budget fluctuations. In FY 2020, this funding is re-aligned to the Maintaining Technology Advantage PE 0605797D8Z.			
Accomplishments/Planned Programs Subtotals		3.807	3.870
C. Other Program Funding Summary (\$ in Millions)			
N/A			
Remarks			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605142D8Z / <i>Systems Engineering</i>	Project (Number/Name) 143 / <i>Program Protection</i>
<u>D. Acquisition Strategy</u> N/A		
<u>E. Performance Metrics</u> <p>The program protection project supports activities focused on: (1) improve system security engineering to reduce risks in sharing and storing controlled unclassified information, to include controlled technical information, (2) improve mitigation to supply chain risks, (3) support cyber vulnerability review assessments, to include review of Program Protection Plans, (4) effective system security engineering policy and guidance, and (6) mature processes to identify and protect critical program information, controlled technical information, critical components and mission functions.</p> <p>Impact of the program protection initiative is assessed based upon number of supported formal independent technical review assessments, , critical programs and technology capabilities cyber vulnerability assessments , and through engagement supporting acquisition, counterintelligence, intelligence and cybersecurity policy initiatives related to program protection.</p>		

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 6					R-1 Program Element (Number/Name) PE 0605142D8Z / <i>Systems Engineering</i>				Project (Number/Name) 842 / <i>Mission Engineering</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
842: <i>Mission Engineering</i>	0.000	0.000	2.000	2.000	-	2.000	2.000	2.000	2.000	2.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Program Element (PE) establishes a dedicated funding line to support activities to carry out responsibilities described in FY 2017 National Defense Authorization Act (NDAA) Section 855 titled Mission Integration Management (MIM).

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
Title: Mission Engineering	-	2.000	2.000
FY 2019 Plans: <ul style="list-style-type: none"> • Coordinate with Joint Service and commanders of the combatant commands to identify major threats, mission scope, Concept of Operations (CONOPS) development, and Operation Plans (OPLAN). • Initiate translation of multi-Service and Coalition mission-based needs for the requirements process, resulting in Capability Requirements. • Develop strategy to use relevant Cross-Service mission threads in coordination with Joint Staff to identify capability gaps. • Determine where multi-Service and Coalition mission areas would benefit from mission engineering and a coordinated implementation approach to set an operational context. 			
FY 2020 Plans: Continue to: <ul style="list-style-type: none"> • Coordinate with Joint Service and commanders of the combatant commands to identify major threats, mission scope, Concept of Operations (CONOPS) development, and Operation Plans (OPLAN). • Initiate translation of multi-Service and Coalition mission-based needs for the requirements process, resulting in Capability Requirements. • Develop strategy to use relevant Cross-Service mission threads in coordination with Joint Staff to identify capability gaps. • Determine where multi-Service and Coalition mission areas would benefit from mission engineering and a coordinated implementation approach to set an operational context. 			
Additional activities: <ul style="list-style-type: none"> • Prioritize and/or provide resources for initial Joint mission analysis. • Begin mission characterization activities for selected Joint missions. - Develop mission based inputs and options for concepts, requirements, prototypes, resources, mission design, & operationally relevant test environment. Includes identification of data needs to assess capability performance (i.e., gain an understanding of objectives, key users, user roles & expectations, and constituent system capabilities). 			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605142D8Z / <i>Systems Engineering</i>	Project (Number/Name) 842 / <i>Mission Engineering</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
- Review available performance and test data for the selected Joint mission area(s).			
FY 2019 to FY 2020 Increase/Decrease Statement: Not applicable.			
Accomplishments/Planned Programs Subtotals		-	2.000
C. Other Program Funding Summary (\$ in Millions) N/A			
Remarks			
D. Acquisition Strategy N/A			
E. Performance Metrics N/A			

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity					R-1 Program Element (Number/Name)							
0400: Research, Development, Test & Evaluation, Defense-Wide / BA 6: RDT&E Management Support					PE 0605151D8Z / Studies and Analysis Support - OSD							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	19.723	5.029	3.534	4.759	-	4.759	4.509	3.891	3.928	4.422	Continuing	Continuing
151: Joint Service Training & Readiness System Development Program	19.723	5.029	3.534	4.759	-	4.759	4.509	3.891	3.928	4.422	Continuing	Continuing

Note

A. Mission Description and Budget Item Justification

The Joint Service programs were established by the Secretary of Defense to improve the readiness and training of the Active and Reserve Components. This project expedites the development of technologies and systems which improve overall effectiveness and performance of the Total Force. It facilitates the sharing of information, while allowing for the transfer of emerging and innovative technologies among the Services and private sector. In addition, this project supports OSD (P&R), other OSD offices, Joint Staff, Unified Commands, and the Services in promoting more efficient and effective use of resources, increasing the effectiveness of military training, and enhancing the readiness and performance of the Total Force. Projects analyze the contributions to readiness of various programs and training techniques and use the results to expedite new concepts and procedures that increase unit effectiveness or decrease costs. Emphasis is placed on developing analytical tools and systematic methodologies to improve readiness and training resource allocations.

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	5.200	3.534	4.831	-	4.831
Current President's Budget	5.029	3.534	4.759	-	4.759
Total Adjustments	-0.171	0.000	-0.072	-	-0.072
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.161	-			
• FFRDC	-0.010	-	-	-	-
• Program Adjustment	-	-	-0.072	-	-0.072

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
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	
Change Summary Explanation Funding adjustment reflects SRRB reductions - Service Requirement Review Board - As part of the Department of Defense reform agenda, the incremental reduction accounts for consolidation and reduction of service contracts.		

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 6					R-1 Program Element (Number/Name) PE 0605151D8Z / Studies and Analysis Support - OSD				Project (Number/Name) 151 / Joint Service Training & Readiness System Development Program			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
151: Joint Service Training & Readiness System Development Program	19.723	5.029	3.534	4.759	-	4.759	4.509	3.891	3.928	4.422	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Joint Service programs were established by the Secretary of Defense to improve the readiness and training of the Active and Reserve Components. This project expedites the development of technologies and systems which improve overall effectiveness and performance of the Total Force. It facilitates the sharing of information, while allowing for the transfer of emerging and innovative technologies among the Services and private sector. In addition, this project supports OSD Personnel and Readiness (P&R), other OSD offices, Joint Staff, Unified Commands, and the Services in promoting more efficient and effective use of resources, increasing the effectiveness of military training, and enhancing the readiness and performance of the Total Force. Projects analyze the contributions to readiness of various programs and training techniques and use the results to expedite new concepts and procedures that increase unit effectiveness or decrease costs. Emphasis is placed on developing analytical tools and systematic methodologies to improve readiness and training resource allocations.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
Title: Joint Service Training & Readiness System Development	5.029	3.534	4.759
Description: The Joint Service programs were established by the Secretary of Defense to improve the readiness and training of the Active and Reserve Components. This project expedites the development of technologies and systems which improve overall effectiveness and performance of the Total Force. It facilitates the sharing of information, while allowing for the transfer of emerging and innovative technologies among the Services and private sector. In addition, this project supports OSD (P&R), other OSD offices, Joint Staff, Unified Commands, and the Services in promoting more efficient and effective use of resources, increasing the effectiveness of military training, and enhancing the readiness and performance of the Total Force. Projects analyze the contributions to readiness of various programs and training techniques and use the results to expedite new concepts and procedures that increase unit effectiveness or decrease costs. Emphasis is placed on developing analytical tools and systematic methodologies to improve readiness and training resource allocations.			
FY 2019 Plans: <ul style="list-style-type: none"> • Continue development and refinement of various models to include Environment and Personnel Management, Relationships between Resources and Readiness, and Readiness Pipelines; • Continue the development of a common framework to improve training of prevention professionals and assess training outcomes for risk and resiliency programs; 			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605151D8Z / <i>Studies and Analysis Support - OSD</i>	Project (Number/Name) 151 / <i>Joint Service Training & Readiness System Development Program</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<ul style="list-style-type: none"> • Continue to investigate additional technologies to promote more efficient and effective use of resources, increasing the effectiveness of military training, and enhancing the readiness and performance of the Total Force; and • Respond to Congressional mandates and directives. <p>FY 2020 Plans:</p> <ul style="list-style-type: none"> • Continue to investigate additional technologies to promote more efficient and effective use of resources, increasing the effectiveness of military training, and enhancing the readiness and performance of the Total Force; and • Respond to Congressional mandates and directives. <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding adjustments reflect increased focus and continuing high demand level associated with this program.</p>			
Accomplishments/Planned Programs Subtotals		5.029	3.534
C. Other Program Funding Summary (\$ in Millions)			
N/A			
Remarks			
D. Acquisition Strategy			
N/A			
E. Performance Metrics			
Each project contained within this program contains specific metrics to determine progress towards completion. Metrics for all include completed and documented analysis provided by the performer. The completion date for that analysis varies with each project. In addition, to that analysis, each effort contains a roadmap addressing the best use of the findings throughout the department. If the results of the analysis show benefit to the Department, those findings are included in policy, doctrine, tactics and procedures.			

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide / BA 6:</i> <i>RDT&E Management Support</i>	R-1 Program Element (Number/Name) PE 0605161D8Z / <i>Nuclear Matters</i>
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	27.410	5.031	5.039	8.307	-	8.307	8.869	9.219	9.595	9.936	Continuing	Continuing
161: <i>Nuclear Matters</i>	27.410	5.031	5.039	8.307	-	8.307	8.869	9.219	9.595	9.936	Continuing	Continuing

Note

FYDP funding increases are addressing the need for technical experts to assist with standing up the Security Incident Response Council (SIRC) and the Nuclear Deterrent Enterprise Review Group (NDERG).

A. Mission Description and Budget Item Justification

The purpose 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 research, development, test and evaluation efforts as well as studies and analyses for nuclear weapons security; use control; nuclear weapons stockpile safety, survivability and performance; countering nuclear threats and office management. Funds are also used to develop and implement plans for stockpile transformation; infrastructure analyses and assessments; DoD-NNSA Nuclear Weapons Council 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 and office management. 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.

Funds address the need for technical experts to assist with standing up the Security Incident Response Council (SIRC) and the Nuclear Deterrent Enterprise Review Group (NDERG). The SIRC is an interagency council established by Presidential Policy Directive-35, "United States Nuclear Weapons Command and Control, Safety, and Security," to provide oversight over nuclear weapons security, incident response capabilities, transportation of U.S. nuclear weapons, and to exercise oversight and coordination with sub-working group. The NDERG is a senior DoD oversight body, chaired by the Deputy Secretary of Defense to oversee and make decisions regarding implementation of recommendations from internal and external DoD nuclear enterprise reviews.

Additionally, OASD(NCB/NM) 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. Funding will be sent to Sandia National Laboratories to lead a team comprised of Sandia, Los Alamos and Lawrence Livermore National Laboratories to develop a nuclear deterrence model. The modeling and analysis results will support the Nuclear Weapons Council strategic planning to include modernization strategies and stockpile composition assessments and investment tradeoffs.

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),

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide / BA 6:</i> <i>RDT&E Management Support</i>	R-1 Program Element (Number/Name) PE 0605161D8Z / <i>Nuclear Matters</i>
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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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	5.232	5.050	8.619	-	8.619
Current President's Budget	5.031	5.039	8.307	-	8.307
Total Adjustments	-0.201	-0.011	-0.312	-	-0.312
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.191	-			
• FFRDC	-0.010	-0.011	-	-	-
• INV-D-032 CBDP Bio-Chem Threats Preparedness Reduction	-	-	-0.312	-	-0.312

Change Summary Explanation

Funding was increased in FY20 to address the need for technical experts to assist with standing up the Security Incident Response Council (SIRC) and the Nuclear Deterrent Enterprise Review Group (NDERG). Additional funds are also to support Nuclear Matters Analysis, requiring technical expertise to consolidate disparate threat assessments, capability modeling, engineering analysis and physics-based performance assessment to provide decision analytics for nuclear deterrence planning and modernization.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
161: Nuclear Matters	27.410	5.031	5.039	8.307	-	8.307	8.869	9.219	9.595	9.936	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The purpose of the Nuclear Matters program is to sustain the U.S. nuclear deterrent posture, counter nuclear threats, and to develop nuclear and conventional physical security equipment. The funds for this program are used to support developmental and test and evaluation efforts as well as studies and analyses for nuclear weapons security; use control; nuclear weapons stockpile safety, survivability and performance; nuclear threat reduction and office management.

Funds are also used to develop and implement plans for stockpile transformation; infrastructure analyses, assessments and models; Nuclear Weapons Council 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 2018	FY 2019	FY 2020
Title: Nuclear Weapons Council (NWC)	0.600	0.559	0.475
Description: The Nuclear Weapons Council (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 2019 Plans:			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense			Date: February 2019		
Appropriation/Budget Activity 0400 / 6		R-1 Program Element (Number/Name) PE 0605161D8Z / <i>Nuclear Matters</i>		Project (Number/Name) 161 / <i>Nuclear Matters</i>	
B. Accomplishments/Planned Programs (\$ in Millions)			FY 2018	FY 2019	FY 2020
<p>- Oversee the activities on the Congressionally mandated Joint DoD-DOE Nuclear Weapons Council and its support committees to include the Nuclear Weapons Council Standing and Safety Committee, the Compartmented Advisory Committee and the Action Officer group</p> <p>FY 2020 Plans:</p> <p>- Oversee the activities on the Congressionally mandated Joint DoD-DOE Nuclear Weapons Council and its support committees to include the Nuclear Weapons Council Standing and Safety Committee, the Compartmented Advisory Committee and the Action Officer group</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement:</p> <p>Funding fluctuates based on funding availability</p>					
<p>Title: International Programs</p> <p>Description: The United States also participates in several international programs of cooperation regarding nuclear weapons with foreign governments and regional defense organizations that involve unclassified and classified information exchanges. In general, these agreements are designed to promote safety and security, advance stockpile stewardship and collaborate in counter-proliferation efforts.</p> <p>FY 2019 Plans:</p> <p>- Execute confidence building programs of cooperation with international partners.</p> <p>- Sponsor international partners at national-level nuclear weapons accident/incident exercises.</p> <p>FY 2020 Plans:</p> <p>- Execute confidence building programs of cooperation with international partners.</p> <p>- Sponsor international partners at national-level nuclear weapons accident/incident exercises.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement:</p> <p>Funding fluctuates based on funding availability</p>			0.197	0.191	0.200
<p>Title: Nuclear Surety</p> <p>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 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 (DASD(NM)).</p> <p>FY 2019 Plans:</p> <p>- Conduct OSD oversight and provide direction for actions taken under DoDD 4540.5, "Transportation of Nuclear Weapons"; DoDD S-5210.81, "United States Nuclear Weapons Command and Control, Safety, and Security"; DoDD S-3150.7, "Controlling</p>			0.822	0.745	0.745

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605161D8Z / <i>Nuclear Matters</i>	Project (Number/Name) 161 / <i>Nuclear Matters</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>the Use of Nuclear Weapons"; DoDD 5210.42 and 5210.42-R, "The DoD Personnel Reliability Program"; and DoDD 5210.41 and S-5210.41-M, "Physical Security of Nuclear Weapons."</p> <p>- Support activities that support nuclear surety policy and provide OSD oversight of the Nuclear Surety program.</p> <p>FY 2020 Plans:</p> <p>- Conduct OSD oversight and provide direction for actions taken under DoDD 4540.5, "Transportation of Nuclear Weapons"; DoDD S-5210.81, "United States Nuclear Weapons Command and Control, Safety, and Security"; DoDD S-3150.7, "Controlling the Use of Nuclear Weapons"; DoDD 5210.42 and 5210.42-R, "The DoD Personnel Reliability Program"; and DoDD 5210.41 and S-5210.41-M, "Physical Security of Nuclear Weapons."</p> <p>- Support activities that support nuclear surety policy and provide OSD oversight of the Nuclear Surety program.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement:</p> <p>Funding fluctuates based on funding availability</p>			
<p>Title: Stockpile Transformation</p> <p>Description: To meets its security needs and those of its allies, the U.S. will need a safe, secure, and reliable nuclear deterrent for the foreseeable future. There's increased risk, absent nuclear testing, in assuring long-term safety and reliability of today's aging stockpile—the legacy warheads left over from the Cold War. Today's nuclear weapons complex is not sufficiently "responsive" to technical problems in the stockpile, or to potential emerging threats. The task is to ensure the U.S. nuclear weapons stockpile and supporting infrastructure, meets long-term national security needs.</p> <p>FY 2019 Plans:</p> <p>- Conduct life cycle activities in support of the nuclear weapons stockpile under DoDD 3150.1, "Nuclear Weapons Life Cycle" and DoDI 5030.55, "DoD Procedures for Joint DoD-DOE Nuclear Weapons Life Cycle Activities.</p> <p>- Manage DoD RDT&E activities for nuclear warheads to include B61, W76, W78, W80(0,1), B83, W87, W88 Weapons.</p> <p>- Support studies for warhead replacement.</p> <p>FY 2020 Plans:</p> <p>- Conduct life cycle activities in support of the nuclear weapons stockpile under DoDD 3150.1, "Nuclear Weapons Life Cycle" and DoDI 5030.55, "DoD Procedures for Joint DoD-DOE Nuclear Weapons Life Cycle Activities.</p> <p>- Manage DoD RDT&E activities for nuclear warheads to include B61, W76, W78, W80(0,1), B83, W87, W88 Weapons.</p> <p>- Support studies for warhead replacement.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement:</p> <p>Funding fluctuates based on funding availability</p>		0.832	1.223
Title: Survivability and Weapons of Mass Destruction (WMD)		0.724	0.711

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense			Date: February 2019		
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 2018	FY 2019	FY 2020
<p>Description: In the 2010 Quadrennial Defense Review (QDR), the SECDEF directed the Department to rebalance its policy, doctrine, and capabilities to better support six key missions. The fifth on the list of key missions is to prevent proliferation and counter weapons of mass destruction. This project directly supports the nation's defense strategy.</p> <p>FY 2019 Plans: Continue to: - Oversee the Nuclear Defense Portfolio. - Plan and coordinate the activities of the National Nuclear Forensics Steering Committee and Working Group. - Develop OSD-wide approach to overseeing Global Nuclear Defense missions within DoD.</p> <p>FY 2020 Plans: Continue to: - Oversee the Nuclear Defense Portfolio. - Plan and coordinate the activities of the National Nuclear Forensics Steering Committee and Working Group. - Develop OSD-wide approach to overseeing Global Nuclear Defense missions within DoD.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Funding fluctuates based on funding availability</p>					
<p>Title: Nuclear Matters Support Program</p> <p>Description: The Nuclear Matters support program conducts studies / analyses; DoD-NNSA Nuclear Weapons Council activities; and provides funding for analytical support functions.</p> <p>FY 2019 Plans: - 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 Freedom of Information Act and Mandatory Declassification Requests.</p> <p>FY 2020 Plans: - 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 Freedom of Information Act and Mandatory Declassification Requests.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement:</p>			0.709	0.723	0.675

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605161D8Z / <i>Nuclear Matters</i>	Project (Number/Name) 161 / <i>Nuclear Matters</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
Funding fluctuates based on funding availability			FY 2020
Title: Physical Security and PPBE Support Description: Provides contract support services that support the Physical Security Enterprise & Analysis Group, the Security Policy Verification Committee and all Planning, Programming, Budgeting and Execution needs for the Office of the Assistant Secretary of Defense for Nuclear, Chemical and Biological Defense Programs / Nuclear Matters. FY 2019 Plans: - Support the Physical Security Enterprise & Analysis Group - Support the Security Policy Verification Committee - Provide all Planning, Programming, budgeting and Execution support for the Nuclear Matters' portfolio FY 2020 Plans: - Support the Physical Security Enterprise & Analysis Group - Support the Security Policy Verification Committee - Provide all Planning, Programming, budgeting and Execution support for the Nuclear Matters' portfolio FY 2019 to FY 2020 Increase/Decrease Statement: Funding fluctuates based on funding availability		1.147	0.887
Title: Nuclear Deterrent Enterprise Review Group (NDERG) Description: The NDERG is a senior Department of Defense 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, created to oversee and make decisions regarding implementation of recommendations from both the internal and external DoD nuclear enterprise reviews. The NDERG meets on a biennial basis and provides a forum for senior Defense leaders to assure accountability in following and tracking the long-term effectiveness of actions taken to improve the health of the nuclear enterprise. FY 2020 Plans: The NDERG will oversee and synchronize all actions across the nuclear enterprise, including those from the Nuclear Posture Review 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 2019 to FY 2020 Increase/Decrease Statement: The NDERG mission was transferred from OSD CAPE to Nuclear Matters.		0.000	-
Title: Security and Incident Response Council (SIRC)		0.000	0.750

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605161D8Z / <i>Nuclear Matters</i>	Project (Number/Name) 161 / <i>Nuclear Matters</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>Description: The SIRC is an interagency council established, as prescribed by Presidential Policy Directive-35 (PPD-35), "United States Nuclear Weapons Command and Control, Safety, and Security," to provide oversight over nuclear weapon security (excluding weapon designs), incident response capabilities, transportation of U.S. nuclear weapons, and to exercise oversight and coordination of the Nuclear Weapons Accident and Incident Response Subcommittee, the Security Policy Verification Committee, and the Nuclear Transportation Working Group and other activities as may from time to time arise that are directly related to Annex B of PPD-35. The SIRC membership includes senior officials from the Department of Defense, the Department of Justice/ Federal Bureau of Investigation, the Departments of Homeland Security, State and Energy and the Office of the Director of National Intelligence.</p> <p>FY 2020 Plans: Assist in coordinating the functions of the SIRC and its supporting subordinate groups; conducting research and analysis to determine compliance and/or deficiency of remediation; provide studies and analyses in the conduct of SIRC support activities; assist with various requirements to develop materials and facilitate liaisons and information exchange with the Services, combatant commands and other agencies.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: The SIRC was established as prescribed by Presidential Policy Directive-35 (PPD-35).</p>			
Accomplishments/Planned Programs Subtotals		5.031	5.039
C. Other Program Funding Summary (\$ in Millions)			
N/A			
Remarks			
D. Acquisition Strategy			
N/A			
E. Performance Metrics			
Success in this area is measured by compliance with various statutes and DoD directives that govern the conduct of the affairs within the Office of DASD(Nuclear Matters). Success is also measured by the currency of information and usability of the website, timeliness and responsiveness of reports due to Congress, performance in various response exercises, and feedback from a number of senior-level government organizations that DASD(Nuclear Matters) supports.			

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I</i> BA 6: <i>RDT&E Management Support</i>	R-1 Program Element (Number/Name) PE 0605170D8Z <i>I Support to Networks and Information Integration</i>
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	58.876	12.141	11.424	9.441	-	9.441	9.341	8.742	9.010	9.010	Continuing	Continuing
170: <i>Support to NII</i>	58.876	12.141	11.424	9.441	-	9.441	9.341	8.742	9.010	9.010	Continuing	Continuing

Note

The FY2019 funding request was reduced by 2.012 million to account for the availability of prior year execution balances.

A. Mission Description and Budget Item Justification

Funding supports Global Positioning System (GPS) User Equipment Synchronization with GPS space and operational control segments to conduct DoD CIO oversight of Global Positioning System (GPS) management and planning activities required for meeting JCIDs requirements. Funding supports policy and guidance for incorporation of alternative means of PNT delivery to augment GPS. Funding also supports the DoD's PNT Oversight Council and inputs into interagency activities under the National Space-Based Positioning, Navigation, and Timing Executive Committee.

Defense Architecture Support includes development, analysis, testing and evaluation of DoD IT Enterprise Reference and solution architecture products in support of the DoD's Joint Information Environment and the closely related Mission Partner Environment.

The Department maintains a catalog of architecture data holdings and provides users the ability to store, search, retrieve, and use DoD architecture data through capabilities provided by the architecture portal. The portal is a central, federated hub for discovery, accessibility, understandability, and reusability of architectures. With the ability to import different architecture tool data and display disparate architecture data in a uniform, consistent method for ease of use and understanding. The portal provides a federated environment for sharing of architectures, mission threads, and other related capability integrated information between various authoritative repositories to increase effectiveness and efficiency of decision-making in a dynamic environment by our customers. Implementations are accessible on both the NIPRNET (unclassified) and SIPRNET (Collateral Classified). Key features of the Defense Architecture Support program focus on: (1) Research and Development of JIE and MPE architectures, (2) Making JIE and MPE architecture data visible, accessible, trusted, understandable, and interoperable (2) enabling reuse of validated architecture data to build "composite" integrated architectures; (3) enabling architecture analysis; and, (4) integrating architecture data into the DoD mainstream decision-making processes. The Department of the Air Force, Army, and Navy CIO's collaborate in the development of federation web services via the Enterprise Architecture and Engineering Panel under the oversight of the DoD CIOs Enterprise Architecture and Service Board to ensure DoD-wide access to and usability of all components of the composite DoD enterprise architecture model, enterprise services, data and technical standards.

The Integrated Planning and Management Project encompasses the National Leadership Command Capability (NLCC) Management Office's (NMO) responsibilities for establishing overall DoD policy and oversight with respect to the capability development, interoperability, standards, and architecture for National and Nuclear Command Capabilities for our National 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. Three overall areas of focus include: 1) National Senior Leader C3 Systems,

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I</i> BA 6: <i>RDT&E Management Support</i>		R-1 Program Element (Number/Name) PE 0605170D8Z <i>I Support to Networks and Information Integration</i>
National Security/Emergency Preparedness (NS/EP), DoD support to Civil Authorities; Continuity of Government (COG); 2) Nuclear C2, Integrated Missile Defense, Tactical Warning, Global Strike; and 3) Cyber Mission Indications and Warnings.		
<p>The Mission Assurance Risk Management System (MARMS) is a Department of Defense (DoD) risk management system that directly supports the Secretary of Defense's Mission Assurance (MA) responsibilities as defined in the DoD Directive (DoDD) 3020.40, Mission Assurance, with the objectives of creating resilience and supporting critical processes to enable the protection of assets and ensuring defense critical missions. MARMS will function as an integration framework spanning multiple security domains that will support risk-informed decision-making, resource investment, and improved synchronization at different levels within DoD. MARMS supports multiple Joint Capability Areas (JCA): Command and Control, Logistics, and Protection. MARMS is an acquisition category (ACAT) III software program and has a "high" impact value for each of the three security objectives (confidentiality, integrity, and availability) in accordance with DoD Instruction (DoDI) 8510.01 and the Committee on National Security Systems Instruction (CNSSI) 1253. This program is funded under Budget Activity 6, RDT&E Management Support because it includes studies and analysis in support of RDT&E efforts.</p> <p>In support of the National Defense Strategy (NDS), GPS continues to provide a force multiplier for the Joint Force and key US allies. Its modernization, and alternative, complement means of PNT provision will maintain this advantage. Superior PNT provides enhanced Joint Force lethality through precision targeting, exacting ISR, efficient logistics, blue force tracking, and a myriad of other force enhancements. These are enjoyed by the Joint Force and key US allies. As such, they ensure efficient and effective force employment.</p> <p>NLCC provides guidance, oversight and policy direction support for Senior Leadership communications, Continuity communications and NC3 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 NLCC 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 NLCC 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. 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.</p>		

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense					Date: February 2019
Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide / BA 6:</i> <i>RDT&E Management Support</i>			R-1 Program Element (Number/Name) PE 0605170D8Z / <i>Support to Networks and Information Integration</i>		
B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	12.583	11.450	15.041	-	15.041
Current President's Budget	12.141	11.424	9.441	-	9.441
Total Adjustments	-0.442	-0.026	-5.600	-	-5.600
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.442	-			
• FFRDC Reduction	-	-0.026	-	-	-
• MARMS Functional Transfer to DTRA	-	-	-5.600	-	-5.600
<u>Change Summary Explanation</u>					
FY 2018: SIBR/STTR Reduction -0.442 million.					
FY 2019: FFRDC Reduction -0.026 million.					
FY2020: Functional Transfer of MARMS to DTRA -5.600 million.					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 6					R-1 Program Element (Number/Name) PE 0605170D8Z / Support to Networks and Information Integration				Project (Number/Name) 170 / Support to NII			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
170: Support to NII	58.876	12.141	11.424	9.441	-	9.441	9.341	8.742	9.010	9.010	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Funding supports Global Positioning System (GPS) User Equipment Synchronization with GPS space and operational control segments to conduct DoD CIO oversight of Global Positioning System (GPS) management and planning activities required for meeting JCIDs requirements. Funding supports policy and guidance for incorporation of alternative means of PNT delivery to augment GPS. Funding also supports the DoD's PNT Oversight Council and inputs into interagency activities under the National Space-Based Positioning, Navigation, and Timing Executive Committee.

Defense Architecture Support includes development, analysis, testing and evaluation of DoD IT Enterprise Reference and solution architecture products in support of the DoD's Joint Information Environment and the closely related Mission Partner Environment.

The Department maintains a catalog of architecture data holdings and provides users the ability to store, search, retrieve, and use DoD architecture data through capabilities provided by the architecture portal. The portal is a central, federated hub for discovery, accessibility, understandability, and reusability of architectures. With the ability to import different architecture tool data and display disparate architecture data in a uniform, consistent method for ease of use and understanding. The portal provides a federated environment for sharing of architectures, mission threads, and other related capability integrated information between various authoritative repositories to increase effectiveness and efficiency of decision-making in a dynamic environment by our customers. Implementations are accessible on both the NIPRNET (unclassified) and SIPRNET (Collateral Classified). Key features of the Defense Architecture Support program focus on: (1) Research and Development of JIE and MPE architectures, (2) Making JIE and MPE architecture data visible, accessible, trusted, understandable, and interoperable (2) enabling reuse of validated architecture data to build "composite" integrated architectures; (3) enabling architecture analysis; and, (4) integrating architecture data into the DoD mainstream decision-making processes. The Department of the Air Force, Army, and Navy CIO's collaborate in the development of federation web services via the Enterprise Architecture and Engineering Panel under the oversight of the DoD CIOs Enterprise Architecture and Service Board to ensure DoD-wide access to and usability of all components of the composite DoD enterprise architecture model, enterprise services, data and technical standards.

The Integrated Planning and Management Project encompasses the National Leadership Command Capability (NLCC) Management Office's (NMO) responsibilities for establishing overall DoD policy and oversight with respect to the capability development, interoperability, standards, and architecture for National and Nuclear Command Capabilities for our National 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. Three 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) Nuclear C2, Integrated Missile Defense, Tactical Warning, Global Strike; and 3) Cyber Mission Indications and Warnings.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605170D8Z / Support to Networks and Information Integration	Project (Number/Name) 170 / Support to NII		
The Mission Assurance Risk Management System (MARMS) is a Department of Defense (DoD) risk management system that directly supports the Secretary of Defense’s Mission Assurance (MA) responsibilities as defined in the DoD Directive (DoDD) 3020.40, Mission Assurance, with the objectives of creating resilience and supporting critical processes to enable the protection of assets and ensuring defense critical missions. MARMS will function as an integration framework spanning multiple security domains that will support risk-informed decision-making, resource investment, and improved synchronization at different levels within DoD. MARMS supports multiple Joint Capability Areas (JCA): Command and Control, Logistics, and Protection. MARMS is an acquisition category (ACAT) III software program and has a “high” impact value for each of the three security objectives (confidentiality, integrity, and availability) in accordance with DoD Instruction (DoDI) 8510.01 and the Committee on National Security Systems Instruction (CNSSI) 1253. This program is funded under Budget Activity 6, RDT&E Management Support because it includes studies and analysis in support of RDT&E efforts.				
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
Title: Support to NII		12.141	11.424	9.441
FY 2019 Plans: Global Positioning System (GPS) User Equipment Synchronization with GPS space and control segments to conduct DoD CIO oversight of Global Positioning System (GPS) management and planning activities required for meeting JCIDs requirements and supporting the National Space-Based Positioning, Navigation and Timing Executive Committee. Funding will support: - Manage the GPS Security Policy (DoDM-O4650.11). - Manage the Information Assurance/COMSEC elements of DoDM-O4650.11. - Develop the NAVWAR manual (DoDM-4650.ed). - 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). - 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.				

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605170D8Z / <i>Support to Networks and Information Integration</i>	Project (Number/Name) 170 / <i>Support to NII</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<ul style="list-style-type: none"> - Manage inventory of DoD GPS receivers. - Analyze and promote alternative PNT delivery means for inclusion in the force structure for force protection. - 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. <p>Continue IT Enterprise and solution architecture development, analysis, and registration processes.</p> <p>Continue NC3 Modeling and Simulation and Analysis – Continue to provide direction and support to the DISA/JSEIO in developing campaign level modeling and simulation tools for NC3. The research and development of the tools will continue to increase the capabilities of modeling and simulation for strategic communications (MASSC) (conferencing capabilities), NC3-N executable architecture management system (NC3-N ExAMS) (analysis of nodes, metrics and assets associated with a Navy communications system), joint operations visualization environment (JOVE) and NC3 integrated scenario modeler (NISM) (provide extendable, transparent multi-level simulations of scenarios).</p> <p>- \$0.800 million – Continue to perform financial database analysis and use the R-DOCs and P-DOCs to create a new structure for the NLCC Investment Strategy. Continue to build automatic extraction tools for the R=DOCs and P-DOCs. Continue developing program lists using programmatic data in Excel. Continue to develop an XML Parser to move data to into a single database to work on Schedule Views (GANTT) and move to a roadmap format, starting off as a manual process, and leading to an automated process.</p> <p>System Engineering and Agile Development per MARMS Requirements Definition Package(RDP)-1. In FY19 MARMS will continue development of CD1 Information Sharing, CD2 Assessments, and CD3 Enhanced Stakeholder Systems to an Initial Operational Capability (IOC). This will provide the department with a single repository of DCI and AT data to perform analysis and manage risk per DODD 3020.40. The development focus in FY19 will be on the development and implementation of the Mission Assurance Workspace and Viewer on SIPRNet and JWICS. The MA Workspace and Viewer will provide the</p>			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605170D8Z / <i>Support to Networks and Information Integration</i>	Project (Number/Name) 170 / <i>Support to NII</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>department's leadership with a consolidated MA dashboard, and analytical capabilities to perform planning and analysis of Mission Assurance activities per DoDD 3020.40 and 3020.45.</p> <p>FY 2020 Plans:</p> <p>Global Positioning System (GPS) User Equipment Synchronization with GPS space and control segments to conduct DoD CIO oversight of Global Positioning System (GPS) management and planning activities required for meeting JCIDs requirements and supporting the National Space-Based Positioning, Navigation and Timing Executive Committee. Funding will support:</p> <ul style="list-style-type: none"> - 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). - 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. 			
			FY 2020

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605170D8Z / <i>Support to Networks and Information Integration</i>	Project (Number/Name) 170 / <i>Support to NII</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<ul style="list-style-type: none"> - 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. <p>Integrated Planning and Management (NLCC): Continue NC3 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 NC3. 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.</p> <p>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.</p> <p>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.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement:</p>			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605170D8Z / Support to Networks and Information Integration	Project (Number/Name) 170 / Support to NII	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
The FY2019 funding request was reduced to account for the availability of prior year execution balances. The funding was re-phased in FY2020 and FY2021.			
FY2020 Functional Transfer of the MARMs program to DTRA -5.600 Million.			
Accomplishments/Planned Programs Subtotals		12.141	11.424
C. Other Program Funding Summary (\$ in Millions)			
N/A			
Remarks			
D. Acquisition Strategy			
N/A			
E. Performance Metrics			
PNT Performance Metrics - Implement and successfully manage PNT Navigation Warfare Instructions and Manuals subordinate to DoDD 4650.05 and Annexes to applicable Operations Plans (OPLANS) and Contingency Plans (CONPLANS) in coordination with the appropriate Unified Combatant Command - Implement the recommendations of the Analyses of Alternatives for the CIO and DCIO C4IIC Global Positioning System (GPS) portfolio of Position, Navigation, and Timing (PNT) programs and activities and additional PNT alternatives included in the US Army PNT Assurance AoA and the PNT Science and Technology Roadmap. - Provide staff support, perform research and conduct studies as directed by the CIO and DCIO C4IIC relating to the Global Positioning System (GPS) portfolio of Position, Navigation, and Timing (PNT) programs and activities and other forms of PNT delivery. Integrated Planning & Management Performance Metrics: - Continue development of the required infrastructure to support Senior Leader Secure Mobile Communications. (measure of systems upgraded/enhanced) - Continue development of the Overarching NLCC Initial Capabilities Document JROCM taskings. Includes both the development of measures to inform subordinate JCIDS documents as well as a roadmap and investment strategy for the sustainment and modernization of the NLCC. - Continue policy development for National Leadership Command Capabilities (NLCC) directives (DoDDs) and instructions (DoDIs) (e.g., updates to DoDI for NC3 Management, develop DoDI for NC3 Governance, etc.). DARS Performance Metrics: - Timely development and issuance of policy, guidance, processes, and technologies to build, populate, govern, operate, and protect the Network. - Policies developed and issued for GIG design, architecture content management, implementation, and operations.			

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 6: RDT&E Management Support</i>					R-1 Program Element (Number/Name) PE 0605200D8Z I <i>General Support to OUSD(I)</i>							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	1.872	165.090	5.693	1.700	-	1.700	1.741	1.770	2.289	2.338	Continuing	Continuing
200: <i>General Spt to USDI</i>	1.872	165.090	5.693	1.700	-	1.700	1.741	1.770	2.289	2.338	Continuing	Continuing

A. Mission Description and Budget Item Justification

Funds are used to execute:

- Sensitive Activities focuses on developing technologies and their applications on sensitive activities within the Office of the Under Secretary of Defense for Intelligence (OUSD(I)).
- Defense Civilian Intelligence Personnel System (DCIPS) provides enhancements and updates to the classified Global Force Management (GFM) Defense Intelligence Organizational Server (DIOS), a priority of the Vice Chairman of the Joint Chiefs of Staff, which tracks both civilian and military positions, associated grades and skill levels and hierarchical organizational relationships.
- Intelligence, Surveillance, Reconnaissance (ISR) Operations requires expert engineering and technical assessments on a wide range of ISR operational issues. Funds will be used to support senior level discussions and decisions on ISR Operations related initiatives, platforms, and sensors.

<u>B. Program Change Summary (\$ in Millions)</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020 Base</u>	<u>FY 2020 OCO</u>	<u>FY 2020 Total</u>
Previous President's Budget	61.451	1.693	1.705	-	1.705
Current President's Budget	165.090	5.693	1.700	-	1.700
Total Adjustments	103.639	4.000	-0.005	-	-0.005
• Congressional General Reductions	-0.061	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	100.000	4.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Departmental Adjustment	3.700	-	-0.005	-	-0.005

Change Summary Explanation

FY 2019 \$4M increase is for Academic Support.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
200: General Spt to USDI	1.872	165.090	5.693	1.700	-	1.700	1.741	1.770	2.289	2.338	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Funds are used to execute:

- Sensitive Activities focuses on developing technologies and their applications on sensitive activities within the Office of the Under Secretary of Defense for Intelligence (OUSD(I)).
- Defense Civilian Intelligence Personnel System (DCIPS) provides enhancements and updates to the classified Global Force Management (GFM) Defense Intelligence Organizational Server (DIOS), a priority of the Vice Chairman of the Joint Chiefs of Staff, which tracks both civilian and military positions, associated grades and skill levels and hierarchical organizational relationships.
- Intelligence, Surveillance, Reconnaissance (ISR) Operations requires expert engineering and technical assessments on a wide range of ISR operational issues. Funds will be used to support senior level discussions and decisions on ISR Operations related initiatives, platforms, and sensors.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
Title: General Spt to USDI	165.090	5.693	1.700
Description: Funds are used to execute: <ul style="list-style-type: none"> - Sensitive Activities focuses on developing technologies and their applications on sensitive activities within the Office of the Under Secretary of Defense for Intelligence (OUSD(I)). - Defense Civilian Intelligence Personnel System (DCIPS) provides enhancements and updates to the classified Global Force Management (GFM) Defense Intelligence Organizational Server (DIOS), a priority of the Vice Chairman of the Joint Chiefs of Staff, which tracks both civilian and military positions, associated grades and skill levels and hierarchical organizational relationships. - Intelligence, Surveillance, Reconnaissance (ISR) Operations requires expert engineering and technical assessments on a wide range of ISR operational issues. Funds will be used to support senior level discussions and decisions on ISR Operations related initiatives, platforms, and sensors. 			
FY 2019 Plans: Sensitive Activities: Provide technology development and concept evaluation for applications in support of OUSD(I). DCIPS: Develop modifications and enhancements to the GFM DIOS as additional requirements are identified by the Joint Staff J-8.			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
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	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>ISR Ops: Provide expert engineering and technical assessments on a wide range of ISR operational issues. Funds will be used to support senior level discussions and decisions on ISR Operations related initiatives, platforms, and sensors.</p> <p>FY 2020 Plans: Sensitive Activities: Continue to provide technology development and concept evaluation for applications in support of OUSD(I).</p> <p>DCIPS: Continue to develop modifications and enhancements to the GFM DIOS as additional requirements are identified by the Joint Staff J-8.</p> <p>ISR Ops: Continue to provide expert engineering and technical assessments on a wide range of ISR operational issues. Funds will be used to support senior level discussions and decisions on ISR Operations related initiatives, platforms, and sensors.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2019 included a \$4M Congressional Add for Academic Support.</p>			
Accomplishments/Planned Programs Subtotals		165.090	5.693
C. Other Program Funding Summary (\$ in Millions)			
N/A			
Remarks			
D. Acquisition Strategy			
N/A			
E. Performance Metrics			
Obtain proficient cutting edge assessments and recommendations on ISR operational issues to support senior level discussions and decisions on ISR Operations related initiatives, platforms, and sensors.			

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: Research, Development, Test & Evaluation, Defense-Wide / BA 6: RDT&E Management Support	R-1 Program Element (Number/Name) PE 0605502D8Z / Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR)
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	97.227	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
502: SBIR/STTR	-	97.227	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

A. Mission Description and Budget Item Justification

The goals of the Department of Defense (DoD) Office of the Secretary of Defense (OSD) Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs are to stimulate technological innovation, increase private sector commercialization of federal research and development (R&D), increase small business participation in federally funded R&D, and foster participation by minority and disadvantaged firms in technological innovation. The SBIR and STTR programs are critical pathways for the Department to tap the innovation of America's small business community and research institutions to support development of cutting-edge technologies that will increase the readiness, modernization and lethality of the Joint Force.

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	0.000	0.000	0.000	-	0.000
Current President's Budget	97.227	0.000	0.000	-	0.000
Total Adjustments	97.227	0.000	0.000	-	0.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	97.227	-			

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).

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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/STTR			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
502: SBIR/STTR	-	97.227	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The goals of the Office of the Secretary of Defense (OSD) Small Business Innovation Research (SBIR) program is to stimulate technological innovation, increase private sector commercialization of federal research and development (R&D), increase small business participation in federally funded R&D, and foster participation by minority and disadvantaged firms in technological innovation. Leveraging the innovation of small business concerns is an important contributor to the development of the cutting-edge technologies that will generate decisive and sustained U.S. military advantages by increasing the readiness, modernization and lethality of the Joint Force. This program supports high priority projects within the DoD Components, their missions, and the Warfighter.

The goals of the OSD Small Business Technology Transfer (STTR) program is to stimulate a partnership of ideas between small business concerns (SBCs) and research institutions through DoD funded research or research and development (R/R&D). By providing awards to SBCs or cooperative R/R&D efforts with research institutions, DoD supports innovation and economic growth to generate decisive and sustained U.S. military advantages. This program supports high priority projects within the DoD Components, their missions, and the Warfighter.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
Title: SBIR	85.239	-	-
<p>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.</p> <p>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:</p> <ul style="list-style-type: none"> • 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; 			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605502D8Z / <i>Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR)</i>	Project (Number/Name) 502 / <i>SBIR/STTR</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<ul style="list-style-type: none"> • 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. <p>Emerging Results from SBIR Investments in FY 2018:</p> <ul style="list-style-type: none"> • The SilentHawk all-wheel drive hybrid-electric military motorcycle prototype enables troops to rapidly and quietly move through rugged terrain with up to 170 miles of range and two hours of quiet mode. • An extended range synthetic aperture radar system that tracks people and vehicles in all weather, day or night, using a ground moving target indicator is now moving into a DoD Program of Record. • An additive manufacturing project to make seamless fuel bladders for helicopters is reinventing a manufacturing process unchanged since World War II, showing promising improvements that will extend service life by 50%, reduce weight by 20%, and reduce total cost of ownership by 40%. • Government testers evaluated small arms stabilization systems with very favorable results that are pending future investment decisions. • A subsurface diver tracking and communications system showed very positive results and is pending review and transition into a program of record. • A mechanism to enable divers to lock-in and lock-out of a submersible transport system demonstrated attributes desired by managers of a program of record. <p>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:</p> <ul style="list-style-type: none"> • 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; 			
			FY 2020

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
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/STTR		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<ul style="list-style-type: none">• 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;• 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.				
<p>Title: STTR</p> <p>Description: The set-aside program that funds cooperative R/R&D projects for small businesses in partnership with research institutions.</p> <p>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:</p> <ul style="list-style-type: none">• 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. <p>Emerging results from the nine STTR projects are unavailable due to project immaturity.</p> <p>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:</p>		11.988	-	-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605502D8Z / <i>Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR)</i>	Project (Number/Name) 502 / <i>SBIR/STTR</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<ul style="list-style-type: none"> • 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; • 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. 			
Accomplishments/Planned Programs Subtotals		97.227	-
C. Other Program Funding Summary (\$ in Millions)			
N/A			
Remarks			
D. Acquisition Strategy			
N/A			
E. Performance Metrics			
N/A			

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity 0400: Research, Development, Test & Evaluation, Defense-Wide / BA 6: RDT&E Management Support					R-1 Program Element (Number/Name) PE 0605790D8Z / Small Business Innovation Research (SBIR)/Small Business Technology Transfer (STTR)							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	2.367	2.539	3.568	-	3.568	3.616	3.658	2.707	2.764	Continuing	Continuing
518: SBIR/Challenge Admin	-	2.367	2.539	3.568	-	3.568	3.616	3.658	2.707	2.764	Continuing	Continuing

A. Mission Description and Budget Item Justification

This Program Element (PE) provides funding for the administration of the Department of Defense (DOD) Small Business Innovation Research (SBIR) Program and the Small Business Technology Transfer (STTR) Program. The DOD SBIR/STTR Program funds over one billion dollars annually in mission oriented research and development (R&D) projects via small technology companies. The purpose of the program is to stimulate technological innovation, increase private sector commercialization of Federal R&D, increase small business participation in Federally funded R&D, foster participation by minority and disadvantaged firms in technological innovation, and cultivate cooperative research & technology transfer between small business and research institutions. The SBIR/STTR Program is codified in 15 USC 638. The SBIR/STTR Programs competitively fund scientific and technical innovation to specifically address the mission needs of participating DOD components.

DOD components participating in the SBIR and STTR Program include the: Army, Navy, Air Force, Defense Advanced Research Projects Agency (DARPA), Missile Defense Agency (MDA), Defense Threat Reduction Agency (DTRA), U.S. Special Operations Command (SOCOM), Joint Science & Technology Office for Chemical & Biological Defense (CBD), National Geospatial-Intelligence Agency (NGA), the Defense Logistics Agency (DLA), the Defense Microelectronics Activity (DMEA), the Defense Health Agency (DHA) and the Office of Secretary of Defense (OSD).

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	2.372	2.545	2.575	-	2.575
Current President's Budget	2.367	2.539	3.568	-	3.568
Total Adjustments	-0.005	-0.006	0.993	-	0.993
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• FFRDC Reduction	-0.005	-0.006	-	-	-
• Other Program Adjustment	-	-	-0.007	-	-0.007
• Internal Realignment for Higher Priorities	-	-	1.000	-	1.000

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
518: SBIR/Challenge Admin	-	2.367	2.539	3.568	-	3.568	3.616	3.658	2.707	2.764	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The SBIR/STTR Program is executed in three phases. The purpose of Phase I is to determine, insofar as possible, the scientific technical and commercial merit, and feasibility of ideas submitted under the SBIR/STTR Program. Phase II is the principal research or research and development effort and is expected to produce a well-defined deliverable prototype. Phase III SBIR/STTR efforts derive from, extend or conclude Phase I or Phase II efforts, and are not funded with SBIR/STTR funds. Under Phase III, companies participating in the SBIR/STTR Program are expected to obtain funding from the private sector and/or non-SBIR/ STTR government sources to develop the prototype into a viable product or non-R&D service for sale in military and/or private sector markets. This PE funds the administrative support to the SBIR/ STTR programs including policy development, monitoring program execution for participating DOD agencies, outreach to small businesses, training for DOD small business and contracting professionals, and an annual conference to bring together the stakeholders for networking and program updates.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
Title: SBIR/Challenge Admin	2.367	2.539	3.568
Description: Program element (PE) 0605790D8Z is the only source of funds for the coordination, administration and execution of the Department's SBIR/STTR Programs. The Director, DOD SBIR/STTR Programs is tasked with providing Departmental SBIR/ STTR policy guidance, oversight and implementation and therefore requires program element (PE) 0605790D8Z to fund these administrative activities. In addition to funding costs for program administration, coordination and execution, PE 0605790D8Z funds essential tasks of the SBIR/STTR Program that are required by law including: (1) Coordinate and execute the administrative portions of the DOD SBIR/STTR Programs including the development of technical topics, preparation of SBIR/STTR R&D solicitations and receipt of proposal responses; (2) Maintain and modify automated processes across the entire SBIR/STTR lifecycle including the development and maintenance of information systems and software required for the measurement, evaluation, and effective management of the Department's SBIR/STTR Programs; (3) Conduct an outreach program including the execution of two National conferences and outreach to small technology companies, potential investors in such companies, small disadvantaged businesses (SDBs), woman owned small businesses (WOSBs), Institutions of Higher Learning, underrepresented states, and others, to facilitate participation in the SBIR/STTR Programs; (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.			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605790D8Z / <i>Small Business Innovation Research (SBIR)/Small Business Technology Transfer (STTR)</i>	Project (Number/Name) 518 / <i>SBIR/Challenge Admin</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>FY 2019 Plans: Program element (PE) 0605790D8Z is the only source of funds for the coordination, administration and execution of the Department's SBIR/STTR Programs. The Director, DOD SBIR/STTR Programs is tasked with providing Departmental SBIR/STTR policy guidance, oversight and implementation and therefore utilizes program element (PE) 0605790D8Z to fund these administrative activities. In addition to funding costs for program administration, coordination and execution, PE 0605790D8Z funds essential tasks of the SBIR/STTR Program that are required by law including:</p> <ul style="list-style-type: none"> (1) Coordinate and execute the administrative portions of the DOD SBIR/STTR Programs including the development of technical topics, preparation of SBIR/STTR R&D solicitations and receipt of proposal responses; (2) Maintain and modify automated processes across the entire SBIR/STTR lifecycle including the development and maintenance of information systems and software required for the measurement, evaluation, and effective management of the Department's SBIR/STTR Programs; (3) Conduct an outreach program including the execution of two National conferences and outreach to small technology companies, potential investors in such companies, SDBs, WOSBs, Institutions of Higher Learning, underrepresented states, and others, to facilitate participation in the SBIR/STTR Programs; (4) Coordinate oversight, collect results, track execution and provide reporting of Phase II technology transition results from the DOD SBIR Commercialization Readiness Program (CRP); and (5) Prepare all reports mandated by law and policy. <p>FY 2020 Plans: Program element (PE) 0605790D8Z is the only source of funds for the coordination, administration and execution of the Department's SBIR/STTR Programs. The Director, DOD SBIR/STTR Programs is tasked with providing Departmental SBIR/STTR policy guidance, oversight and implementation and therefore utilizes program element (PE) 0605790D8Z to fund these administrative activities. In addition to funding costs for program administration, coordination and execution, PE 0605790D8Z funds essential elements of the SBIR/STTR Program that are required by law including:</p> <ul style="list-style-type: none"> (1) Coordinate and execute the administrative portions of the DOD SBIR/STTR Programs including the development of technical topics, preparation of SBIR/STTR R&D solicitations and receipt of proposal responses; (2) Maintain and modify automated processes across the entire SBIR/STTR lifecycle including the development and maintenance of information systems and software required for the measurement, evaluation, and effective management of the Department's SBIR/STTR Programs; (3) Conduct an outreach program including the execution of two National conferences and outreach to small technology companies, potential investors in such companies, SDBs, WOSBs, Institutions of Higher Learning, underrepresented states, and others, to facilitate participation in the SBIR/STTR Programs; 			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605790D8Z / <i>Small Business Innovation Research (SBIR)/Small Business Technology Transfer (STTR)</i>	Project (Number/Name) 518 / <i>SBIR/Challenge Admin</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>(4) Coordinate oversight, collect results, track execution and provide reporting of Phase II technology transition results from the DOD SBIR Commercialization Readiness Program (CRP); and</p> <p>(5) Prepare all reports mandated by law and policy.</p> <p><i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> Under Program element (PE) 0605790D8Z the DOD SBIR/STTR Program Office utilizes this sole source of funds for the coordination, administration and execution of DOD's SBIR/STTR Programs. The various areas that are administered require continuous enhancements for stakeholders to successfully participate in these programs. This results in a need for an increase to the funding source. This increase addresses enhancements to the outreach, collection and reporting portion of the program as well as training - more specifically fraud waste and abuse training required by law with respect to the participation in these programs.</p>			
Accomplishments/Planned Programs Subtotals		2.367	2.539
C. Other Program Funding Summary (\$ in Millions)			
N/A			
Remarks			
D. Acquisition Strategy			
Not applicable for this item.			
E. Performance Metrics			
<p>Performance supports the administration of the program and compliance with statutory requirements.</p> <p>For PE 0605790D8Z, management and administration of the DOD SBIR/STTR Programs, the following measures have been established to meet requirements as mandated by law: 1) Coordinate and execute the administrative portions of the DOD SBIR/STTR Programs, especially the creation of the six solicitations; 2) Maintain and improve automated processes across the entire SBIR/STTR lifecycle; 3) Conduct an outreach program, especially the planning and execution of two National conferences and outreach to small technology companies and Institutions of Higher Learning; 4) Coordinate oversight, collect results, track execution and provide reporting of Phase II commercialization; 5) Prepare all reports mandated by law and policy.</p>			

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I</i> BA 6: <i>RDT&E Management Support</i>					R-1 Program Element (Number/Name) PE 0605797D8Z <i>I Maintaining Technology Advantage</i>							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	0.000	0.000	19.936	-	19.936	19.748	19.244	19.500	19.808	Continuing	Continuing
138: <i>Data Vulnerability Assessment and Analysis</i>	-	0.000	0.000	9.344	-	9.344	9.044	8.426	8.569	8.755	Continuing	Continuing
139: <i>Joint Acquisition Protection Exploitation Cell (JAPEC)</i>	-	0.000	0.000	5.592	-	5.592	5.704	5.818	5.931	6.053	Continuing	Continuing
158: <i>Program and Technology Protection</i>	-	0.000	0.000	5.000	-	5.000	5.000	5.000	5.000	5.000	Continuing	Continuing

Note

This continuity of effort is being transferred from the Defense Technical Analysis PE 0605798D8Z and the Systems Engineering PE 0605142D8Z beginning in FY 2020 to more appropriately align the efforts within the current Office of the Under Secretary of Defense for Research and Engineering (OUSD(R&E)) organization.

A. Mission Description and Budget Item Justification

This Program Element provides funding to support efforts to maintain DoD's technology advantage. The targeting of U.S. capabilities by our strategic competitors create the potential to degrade core U.S. military technological advantages through unwanted technology transfer. The technology transfer, primarily unclassified technology, threatens DoD's ability to maintain the technology advantage required to support the lethality and survivability of the Joint Force. DoD is executing a campaign plan to maintain DoD's technology advantage. First DoD is promoting strategic technology investment to provide DoD access to new and innovative technology. These investments are required to create breakthroughs in key areas of basic research, foster transition and decrease time to market of applied research to economically viable companies, and harvest U.S. innovation or with likeminded allies. Secondly, DoD must ensure its strategic technology investments are protected against unwanted technology transfer by developing and maintaining the tools and techniques that enable the U.S. engage in technology transfer at the time, place, and parties of our choosing. Thirdly, DoD must combat adversaries' attempts to thwart U.S. technology security mechanisms to control technology transfer. The Department will support these three efforts by developing the appropriate suite of analytic tools, a data acquisition strategy, and utilize program protection activities to address the threat over the long term. Program Protection Planning includes protection of critical program information, critical components and mission functions, and integrates high level security policies and practical expertise to specific RDA practices, systems engineering activities, and risk reduction activities. Through this initiative the Department is maturing system security engineering methodologies to protect controlled unclassified information, to include controlled technical information on contractor networks; improve mitigation of supply chain risk management risks, improve integration of cybersecurity into the engineering processes, mature processes to identify Critical Program Information integration of defense exportability features and improve program protection planning.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I</i> BA 6: <i>RDT&E Management Support</i>	R-1 Program Element (Number/Name) PE 0605797D8Z <i>I Maintaining Technology Advantage</i>
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B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	0.000	0.000	0.000	-	0.000
Current President's Budget	0.000	0.000	19.936	-	19.936
Total Adjustments	0.000	0.000	19.936	-	19.936
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• FY 2020 Transfer from Exisiting Program Elements	-	-	19.936	-	19.936

Change Summary Explanation

This continuity of effort is being transferred from the Defense Technical Analysis PE 0605798D8Z and the Systems Engineering PE 0605142D8Z beginning in FY 2020 to more appropriately align the efforts within the current OUSD(R&E) organization.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 6					R-1 Program Element (Number/Name) PE 0605797D8Z / Maintaining Technology Advantage				Project (Number/Name) 138 / Data Vulnerability Assessment and Analysis			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
138: Data Vulnerability Assessment and Analysis	-	0.000	0.000	9.344	-	9.344	9.044	8.426	8.569	8.755	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Significant amounts of DoD's technical information resides on unclassified networks where it is at risk of being targeted by adversarial cyber espionage campaigns. In addition, DoD's technical information is subject to other loss mechanisms. Protecting DoD unclassified controlled technical information is a high priority for the Department, and is critical to preserving intellectual property, enhancing the competitive capabilities of our national industrial base, and maintaining DoD's technology advantage. This information, while unclassified, includes data and intellectual property concerning defense systems requirements, concepts of operations, technologies, designs, engineering, systems production, system maintenance /sustainment and component manufacturing. To maintain full confidence in our systems, the Department must also assess the effect the loss of this information has on our warfighting capabilities. DoD contractors who produce or access controlled technical information must incorporate security (e.g., implement cybersecurity standards on contractor information system networks, report cyber-intrusion incidents, manage deemed exports, and other mechanisms that result in the loss of this information) to protect this information from all loss mechanisms. These requirements are important, but insufficient in the face of a determined adversary. The Department must take steps to understand the impacts of losses, rethink how we safeguard our capabilities, and deter our strategic competitors.

This project supports protection of unclassified controlled technical information, and an analysis of losses, to determine consequences and appropriate requirements, acquisition, programmatic, and strategic courses of action to include deterring our strategic competitors and identifying opportunities to promote our innovation base.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
Title: Data Vulnerability Program	-	-	9.344
Description: The Data Vulnerability Assessment and Analysis project will support efforts to maintain DoD's technology advantage. The data vulnerability program will invest in advancing analytic tool suite capabilities and build common data model for supply chain analytics. The Initial Operating Capability (IOC) of the technical solution should improve the capability to continuously monitor and assess the Defense Industrial Base and the National Security Innovation Base in order to detect and characterize threats and enable partners with relevant authorities to address these threats in a timely manner and collaborate on these efforts. The data vulnerability program will continue to support projects with stakeholders.			
FY 2020 Plans: In FY 2020, the program will fully incorporate changes from the FY 2017 NDAA Section 901 reorganization by adjusting to the new organizational structures within both the new USD(R&E) and USD(A&S). The program will continue to collect and integrate proactive protection efforts and conduct trend analysis of protection efforts for the Department's critical acquisition programs and			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605797D8Z / <i>Maintaining Technology Advantage</i>	Project (Number/Name) 138 / <i>Data Vulnerability Assessment and Analysis</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
technologies and incorporate findings into protection processes and activities. The program will continue to advance analytic tool suite capabilities and build common data model.			
FY 2019 to FY 2020 Increase/Decrease Statement: Funding was transferred from PE 0605798D8Z in FY 2020.			
Accomplishments/Planned Programs Subtotals		-	9.344
C. Other Program Funding Summary (\$ in Millions) N/A			
Remarks			
D. Acquisition Strategy N/A			
E. Performance Metrics The Data Vulnerability Assessment and Analysis metric is the number of completed cases.			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
139: Joint Acquisition Protection Exploitation Cell (JAPEC)	-	0.000	0.000	5.592	-	5.592	5.704	5.818	5.931	6.053	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

DoD established a joint analysis capability (Joint Acquisition Program and Exploitation Cell (JAPEC)) to conduct comprehensive assessments of controlled unclassified technical information losses, and engage acquisition and intelligence sources, to determine consequences and appropriate preventative/mitigation actions. The JAPEC requires the ability to detect and characterize past technology losses, conduct damage assessments of lost information, and provide various insights with predictive value. Together with supporting organizations, the JAPEC enables comprehensive, detailed assessments of U.S. military technological vulnerability, as well as inform the development and application of effective policies, countermeasures, and enforcement actions to preserve U.S. technical superiority in all warfighting domains.

JAPEC, and supporting organizations, require an analytic capability to synchronize, integrate, coordinate and inform DoD efforts in order protect the acquisition and investment in sensitive U.S. technologies from adversaries and better exploit opportunities to deter, deny and disrupt adversary activities.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
Title: Joint Acquisition Protection Exploitation Cell (JAPEC)	-	-	5.592
Description: Integrate controlled unclassified information, to include Controlled Technical Information (CTI) protection efforts across DoD to proactively mitigate losses and exploit opportunities to deter, deny, and disrupt adversaries that may threaten U.S. military advantage.			
FY 2020 Plans: - Identify critical acquisition programs and technologies requiring elevated protection. - Identify threats and recommend advanced protection mechanisms within and across DoD programs/technologies. - Support assessment of vulnerabilities associated with known losses.			
FY 2019 to FY 2020 Increase/Decrease Statement: Funding was transferred from PE 0605798D8Z in FY 2020.			
Accomplishments/Planned Programs Subtotals	-	-	5.592

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

N/A

Remarks

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605797D8Z / <i>Maintaining Technology Advantage</i>	Project (Number/Name) 139 / <i>Joint Acquisition Protection Exploitation Cell (JAPEC)</i>
<u>D. Acquisition Strategy</u> N/A		
<u>E. Performance Metrics</u> Programmatic performance will be assessed against the specific items listed in the Planned Program section.		

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
158: Program and Technology Protection	-	0.000	0.000	5.000	-	5.000	5.000	5.000	5.000	5.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Department of Defense (DoD) must address cybersecurity and supply chain risks to DoD networks, weapons systems, and information stored and processed on both DoD and Defense Industrial Base (DIB) unclassified contractor information networks that support DoD programs. Increased reliance on the internet as a vehicle for sharing information, globalization of the supply chain, and advanced persistent threats (APTs) that can evade commercially available security tools and defeat generic security best practices, drives the need for diligent program protection planning and execution. Program Protection Planning includes protection of classified and unclassified controlled technical information, critical program information, critical components and critical mission functions, and integrates high level security policies and practical expertise to specific acquisition and S&T practices, systems engineering activities, and risk reduction activities. Through this initiative the Department is maturing system security engineering methodologies to protect controlled unclassified information, to include controlled technical information on contractor information networks; improve mitigation and management of supply chain risk management risks, improve integration of cybersecurity into the engineering processes, improve software assurance practices, mature processes to identify and protect Critical Program Information and improve program protection planning. Activities carried out, support implementation of DoD Instruction 5200.44 Trusted Systems and Networks with the use of proven mitigation techniques and tools, the ongoing refinement of risk management processes, and creation of needed technology; implementation of DoD Instruction 5200.39 Critical Program Information (CPI) Identification and Protection Within Research, Development, Test, and Evaluation (RDT&E) to identify and protect Critical Program Information; and implementation of DoD Instruction 8582.01 Security of Unclassified DoD Information on Non-DoD Information Systems for Safeguarding Controlled Unclassified Information on contractor owned networks.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
Title: Program and Technology Protection	-	-	5.000
Description: The project provides system security engineering policy, guidance and objective assessments to reduce risks in sharing and storing Controlled Technical Information, improve mitigation of supply chain risk management risks, improve integration of cybersecurity into the engineering processes, integrate defense exportability and anti-tamper practices, mature processes to identify Critical Program Information and improve program protection planning. Activities carried out support implementation of DoD Instruction 5200.44 Trusted Systems and Networks with the use of proven mitigation techniques and tools, the ongoing refinement of risk management processes; implementation of DoD Instruction 5200.39 Critical Program Information (CPI) Identification and Protection Within Research, Development, Test, and Evaluation (RDT&E) to identify and protect Critical Program Information; and implementation of DoD Instruction 8582.01 Security of Unclassified DoD Information on Non-DoD Information Systems for Safeguarding Controlled Unclassified Information on contractor owned networks.			
FY 2020 Plans:			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605797D8Z / <i>Maintaining Technology Advantage</i>	Project (Number/Name) 158 / <i>Program and Technology Protection</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
Provide support to Independent Technical Review Assessment and Cyber Vulnerability Review Assessment teams in conduct of broad program protection planning activities to assess: <ul style="list-style-type: none"> - 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 2019 to FY 2020 Increase/Decrease Statement: This effort was transferred from PE 0605142D8Z in FY 2020.			
Accomplishments/Planned Programs Subtotals		-	5.000
C. Other Program Funding Summary (\$ in Millions) N/A			
Remarks			
D. Acquisition Strategy N/A			
E. Performance Metrics The program protection project supports activities focused on: (1) improve system security engineering to reduce risks in sharing and storing controlled unclassified information, to include controlled technical information, (2) improve mitigation to supply chain risks, (3) support cyber vulnerability review assessments, to include review			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605797D8Z / Maintaining Technology Advantage	Project (Number/Name) 158 / Program and Technology Protection
<p>of Program Protection Plans and formal independent technical reviews , (4) mature system security engineering policy and guidance, and (5) mature processes to identify and protect critical program information, controlled unclassified information, critical components and mission functions.</p> <p>Impact of the program protection initiative is assessed based upon number of supported cyber vulnerability assessments, formal independent technical review assessments, critical programs and technology capabilities cyber vulnerability assessments , and through engagement supporting research, development, acquisition, counterintelligence, intelligence and cybersecurity policy initiatives related to program protection.</p>		

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	-	25.815	27.425	16.875	-	16.875	16.721	15.771	16.010	16.287	Continuing	Continuing
796: Laboratory Resource Management	-	6.282	6.110	5.445	-	5.445	5.400	4.767	4.837	4.919	Continuing	Continuing
797: Defense Technology Analysis	-	5.930	5.487	8.947	-	8.947	8.866	8.633	8.758	8.902	Continuing	Continuing
798: Defense Support Teams	-	2.118	1.962	2.483	-	2.483	2.455	2.371	2.415	2.466	Continuing	Continuing
102: Data Vulnerability Assessment and Analysis	-	11.485	13.866	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

Note

Project 102 funding is realigned to PE 0605797D8Z beginning in FY 2020.

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 for research and engineering (R&E) matters. In this capacity, the USD(R&E) has the responsibility to conduct analyses and studies; develop policies; provide technical leadership, oversight and advice; make recommendations; and issue guidance for Department of Defense (DoD) R&E programs. Additionally, the USD(R&E) provides technical support on R&E aspects of programs subject to review by the Defense Acquisition Board, to include assessments of technology maturity consistent with DoD acquisition policy. The mission of the DoD R&E program is to create, demonstrate, prototype, and apply technology that enables affordable and decisive military superiority. Pursuing the R&E mission requires attention to: (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. 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.

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 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 Defense Technology Analysis project conducts assessments and analysis to ensure maximum utilization of research and development funds and to accomplish the overall objectives of the S&T program. Funds are required for technical, analytical and management support, equipment and supplies, travel, and publications.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 6:</i> <i>RDT&E Management Support</i>	R-1 Program Element (Number/Name) PE 0605798D8Z / <i>Defense Technology Analysis</i>
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The DoD's key expertise for reviewing and guiding R&E programs resides in the USD(R&E). The USD(R&E) staff augment their responsibilities through their connections to technology experts in various fields throughout academia, industry, and government. The Defense Support Teams project supports the directed responsibilities by building teams of technology experts to conduct program technical assessments. The teams analyze the key engineering problem areas and offer adjustments in the development and test plan; alternate technical approaches; or new technologies that could enable successful development. The teams provide unbiased reviews and gather advice from the Nation's leading technical experts.

This PE also provides funding for Data Vulnerability Assessment and Analysis to establish a joint analysis capability to conduct comprehensive assessments of unclassified information losses, engaging acquisition and intelligence sources to determine consequences and appropriate preventative/mitigation actions.

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	24.365	24.487	28.392	-	28.392
Current President's Budget	25.815	27.425	16.875	-	16.875
Total Adjustments	1.450	2.938	-11.517	-	-11.517
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	3.000	3.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-1.503	-			
• FFRDC Reduction	-0.047	-0.062			
• Internal Realignment for Higher Priorities	-	-	3.500	-	3.500
• Realignment of Project 102 to PE 0605797D8Z	-	-	-14.936	-	-14.936
• Other Program Adjustments	-	-	-0.081	-	-0.081

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

Project: 796: *Laboratory Resource Management*

 Congressional Add: *Program Increase - Defense Technology Transfer*

	FY 2018	FY 2019
	2.831	2.992
Congressional Add Subtotals for Project: 796	2.831	2.992
Congressional Add Totals for all Projects	2.831	2.992

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
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	
<div>Change Summary Explanation</div> <div>FY 2020 Internal Realignment for Higher Priorities includes: \$1.500 million adjustment to support Defense Technology Transfer pilot programs executed under Project 796. \$2.000 million adjustment for support requirements in the area of Counter-Unmanned Aerial Systems as a result of the USD(R&E) reorganization; executed under Project 797.</div>		

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
796: Laboratory Resource Management	-	6.282	6.110	5.445	-	5.445	5.400	4.767	4.837	4.919	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Defense Laboratory Office (DLO) provides advocacy, strategic planning, and policy for the DoD's in-house laboratories. The DoD Laboratory Enterprise consists of more than 60 laboratories with approximately 67,000 employees (approximately 50,000 of whom are scientists and engineers). The Defense Laboratory Office develops plans and investment strategies for laboratory infrastructure, technology transfer programs, and personnel development. Section 211 of the FY 2017 National Defense Authorization Act (NDAA) also transferred the management of the laboratory demonstration program at Science and Technology Reinvention Laboratories (STRs) from the Under Secretary of Defense for Personnel and Readiness (USD(P&R)) to the Assistant Secretary of Defense for Research and Engineering (ASD(R&E)). Section 218 of the FY 2018 NDAA amended the authority by redesignating management to the Under Secretary of Defense for Research and Engineering (USD(R&E)).

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
Title: Defense Laboratory Office	3.451	3.118	5.445
Description: Provides advocacy, strategic planning, and policy for the DoD's in-house laboratories. Develops plans and investment strategies for laboratory infrastructure, technology programs, and personnel development.			
FY 2019 Plans: <ul style="list-style-type: none"> The DLO will conduct strategic planning and policy development for oversight of DoD in-house laboratories and the Laboratory Quality Enhancement Program Panels. The DLO will continue to process all personnel and laboratory demonstration items and monitor the status of Sec. 233 Management pilot programs in each of the Services. In addition, the DLO will implement the strategic plan for technology transfer within the Department. 			
FY 2020 Plans: <ul style="list-style-type: none"> The DLO will continue to develop plans, policies and investment strategies for laboratory infrastructure, technology transfer programs, personnel development, and the Laboratory Quality Enhancement Program Panels that supports the in-house Defense Laboratory Enterprise. The DLO will develop an advanced technical training pilot program to efficiently and effectively provide insight on technology transfer from DoD laboratories to the market. Future initiatives will look at developing a single intellectual property (IP) docketing and tracking system across DoD that will enable real time tracking of the DoD IP portfolio. 			
FY 2019 to FY 2020 Increase/Decrease Statement:			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605798D8Z / <i>Defense Technology Analysis</i>	Project (Number/Name) 796 / <i>Laboratory Resource Management</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
The increase to FY 2020 from FY 2019 supports the DoD Technology Transfer program.			
Accomplishments/Planned Programs Subtotals		3.451	5.445
	FY 2018	FY 2019	
Congressional Add: Program Increase - Defense Technology Transfer	2.831	2.992	
FY 2018 Accomplishments: <ul style="list-style-type: none"> Identified innovative, promising and critical technologies in the DoD and Federal laboratories, academia, and the private sector that are in the developmental phase or ready to transfer/transition directly to the warfighter. Developed and provided manufacturing, design, business guidance and assistance to overcome technical hurdles to transition these technologies for DoD operational use more rapidly, reliably, and cost-effectively. Performed evaluation of emerging design, development, and manufacturing technology and techniques to evaluate innovative methods to transition technology (i.e., additive manufacturing) and identify and analyze the ability of specific companies to effectively manufacture and deliver innovative technology of interest to the DoD sponsor. Worked with Program Managers to help transition innovative technologies to the warfighter, including providing systems engineering, material samples, requirements generation, technology scouting, and/or other services associated with improving the transition of technology to the warfighter. Developed a mature Virtual Industry Day to meet the needs of emerging DoD technology scouting efforts. 			
FY 2019 Plans: <ul style="list-style-type: none"> Initiate innovative technology transfer pilot programs. Produce engagement tools to highlight mechanisms and enable greater technology transfer to the defense industrial base, non traditional performers and other private sector entities. 			
Congressional Adds Subtotals	2.831	2.992	
C. Other Program Funding Summary (\$ in Millions)			
N/A			
Remarks			
D. Acquisition Strategy			
N/A			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605798D8Z / <i>Defense Technology Analysis</i>	Project (Number/Name) 796 / <i>Laboratory Resource Management</i>
E. Performance Metrics <p>The performance of the Laboratory Resource Management project is based on the success of initiatives to implement strategic planning objectives. Measures include the quality and timeliness of policy, plans, guidance, reports, and processes.</p>		

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
797: Defense Technology Analysis	-	5.930	5.487	8.947	-	8.947	8.866	8.633	8.758	8.902	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Defense Technology Analysis (DTA) project provides 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. Furthermore, it ensures that the technology being developed is affordable and minimizes system development risk. The DTA program conducts assessments and analyses to ensure maximum utilization of research and development funds to accomplish the overall objectives of the S&T program. Funds are required for technical, analytical, management support, travel, and publications.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
Title: Defense Technology Analysis	5.930	5.487	8.947
Description: The Defense Technology Analysis (DTA) 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 2019 Plans: In FY 2019, the DTA project will provide engineering, scientific, analytical, and managerial support to the OUSD(R&E) in developing strategies, plans, and policies to develop and exploit technology; conducting technology analyses, making recommendations, and developing guidance for S&T plans and programs; reviewing acquisition programs and making recommendations to optimize effectiveness of the DoD investments; and oversight of S&T issues and initiatives and responding to Congressional special interests.			
FY 2020 Plans: In FY 2020, the DTA project will 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; 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.			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605798D8Z / <i>Defense Technology Analysis</i>	Project (Number/Name) 797 / <i>Defense Technology Analysis</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>The program will also conduct technology analyses to support R&E program investment decisions. For selected acquisition programs and efforts, respective program issues will be reviewed and technical solutions will be offered to program managers. The maturity of technologies that are candidates for transition to acquisition programs will also be assessed.</p> <p><i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> The increase in FY 2020 represents a realignment of support requirements as a result of the OUSD(R&E) reorganization.</p>			
Accomplishments/Planned Programs Subtotals		5.930	5.487
C. Other Program Funding Summary (\$ in Millions)			
N/A			
Remarks			
D. Acquisition Strategy			
N/A			
E. Performance Metrics			
<p>Several indicators allow the Department to measure the success of the DTA program element. The number of efforts funded and completed satisfactorily and the OUSD(R&E) influence on S&T program decisions serve as valuable indicators of the program's effectiveness. Feedback into the oversight mechanisms of the program to guide investment decisions serve as additional metrics.</p>			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
798: Defense Support Teams	-	2.118	1.962	2.483	-	2.483	2.455	2.371	2.415	2.466	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Project 798 is realigned to Project 797 within the Defense Technology Analysis program element, 0605798D8Z, beginning in FY 2020.

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. The Defense Support Teams project supports the directed responsibilities by building teams of technology experts to conduct program technical health check-ups. The teams analyze the key engineering problem areas and offer adjustments in the development and test plans, alternate technical approaches, or new technologies that could enable successful development. The teams provide unbiased reviews and gather advice from the Nation's leading technical experts.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
Title: Defense Support Teams	2.118	1.962	2.483
Description: The Defense Support Teams project supports the directed responsibilities by building teams of technology experts to conduct program technical health check-ups. The teams analyze the key problem areas and offer adjustments in the development plans, alternate technical approaches, or new technologies that could enable successful development. The teams provide unbiased reviews and gather advice from the Nation's leading technical experts.			
FY 2019 Plans: In FY 2019, support teams will be established and technology analyses conducted to support R&E program investment decisions. For selected acquisition programs and efforts, the teams will review in technical detail the respective program issues and offer technical solutions to program managers. The support teams will assess the maturity of technologies that are candidates for transition to acquisition programs.			
FY 2020 Plans: In FY 2020, support teams will be established and technology analyses conducted to support R&E program investment decisions. For selected acquisition programs and efforts, the teams will review in technical detail the respective program issues and offer technical solutions to program managers. The support teams will assess the maturity of technologies that are candidates for transition to acquisition programs.			
FY 2019 to FY 2020 Increase/Decrease Statement:			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605798D8Z / <i>Defense Technology Analysis</i>	Project (Number/Name) 798 / <i>Defense Support Teams</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
The increase from FY 2019 to FY 2020 reflects minor budget adjustments.			
Accomplishments/Planned Programs Subtotals		2.118	1.962
			2.483
C. Other Program Funding Summary (\$ in Millions) N/A			
Remarks			
D. Acquisition Strategy N/A			
E. Performance Metrics Several indicators allow the Department to measure the success of the Defense Technology Analysis (DTA) PE. The number of technological introspections, as evidenced by completed support teams and OUSD(R&E) influence on acquisition decisions, serve as valuable indicators of the program's effectiveness. The establishment and outputs of Defense Support Teams are additional indicators of program metrics. To guide investment decisions, feedback into the oversight mechanisms of the science and technology (S&T) program serve as additional metrics.			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 6					R-1 Program Element (Number/Name) PE 0605798D8Z / Defense Technology Analysis				Project (Number/Name) 102 / Data Vulnerability Assessment and Analysis			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
102: Data Vulnerability Assessment and Analysis	-	11.485	13.866	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Most DoD technical information resides on unclassified networks where it is at risk of being targeted for cyber espionage campaigns. Protecting DoD unclassified controlled technical information is a high priority for the Department, and is critical to preserving intellectual property and competitive capabilities of our national industrial base. To maintain full confidence in our systems, the Department must also assess the effect the loss of this information has on our warfighting capabilities. DoD contractors who produce or access controlled technical information must incorporate security standards on their networks and report cyber-intrusion incidents that result in the loss of this information. These requirements are important, but insufficient in the face of a determined adversary. The Department must take steps to understand the impacts of losses and rethink how we safeguard our capabilities. This information, while unclassified, includes data and intellectual property concerning defense systems requirements, concepts of operations, technologies, designs, engineering, systems production, and component manufacturing.

This project supports protection of unclassified controlled technical information, and an analysis of losses, to determine consequences and appropriate requirements, acquisition, programmatic, and strategic courses of action.

In FY 2020, this funding is transferred to the Maintaining Technology Advantage PE 0605797D8Z, in accordance with the new OUSD(R&E) re-organization.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
Title: Data Vulnerability Program	11.485	13.866	-
Description: The Data Vulnerability Assessment and Analysis project will establish a joint analysis capability to conduct comprehensive assessments of controlled unclassified technical information losses, and will engage acquisition and intelligence sources, to determine consequences and appropriate preventative/mitigation actions.			
FY 2019 Plans: In FY 2019, the program will incorporate changes into governance models and documents to accommodate changes from the Maintaining DoD Technological Advantage CFT and the FY 2017 NDAA Section 901 reorganization. The program will adjust manning for proactive protection efforts linked to the Department's critical acquisition programs and technologies. In addition, it will collect and integrate the Department's critical acquisition programs and tier for proactive protection efforts and conduct trend analysis on the Department's critical acquisition programs and technologies to incorporate findings into the nomination/protection			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605798D8Z / <i>Defense Technology Analysis</i>	Project (Number/Name) 102 / <i>Data Vulnerability Assessment and Analysis</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
processes. The program will finalize colocation with DC3 and DoD DAMO and continue to advance analytic tool suite capabilities and build common data model.			
<i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> Level of effort is consistent between FY 2019 and FY 2020. Small changes reflect minor budget fluctuations.			
Accomplishments/Planned Programs Subtotals		11.485	13.866
C. Other Program Funding Summary (\$ in Millions) N/A			
Remarks			
D. Acquisition Strategy N/A			
E. Performance Metrics The Data Vulnerability Assessment and Analysis metric is the number of completed cases.			

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide</i> / BA 6: <i>RDT&E Management Support</i>	R-1 Program Element (Number/Name) PE 0605804D8Z / <i>Development Test & Evaluation</i>
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	79.102	19.810	20.133	22.203	-	22.203	22.249	22.592	20.977	21.422	Continuing	Continuing
804: <i>Development Test & Evaluation</i>	79.102	19.810	20.133	22.203	-	22.203	22.249	22.592	20.977	21.422	Continuing	Continuing

A. Mission Description and Budget Item Justification

This Program Element (PE) establishes the dedicated funding line to carry out the duties in accordance with Department of Defense Instruction (DoDI) 5000.02 Change 3 dated August 10, 2017 and the FY 2018 National Defense Authorization Act (NDAA) section 838. Specific responsibilities are outlined in DoDI 5134.17 Change 1 dated September 2015. The Deputy Director for Developmental Test and Evaluation (DT&E) is the principal advisor to the Secretary of Defense, the Under Secretary of Defense, Research and Engineering (OUSD(R&E)) on Development Test and Evaluation (DT&E) in the DoD.

The DT&E program element supports the three strategic lines of effort within the National Defense Strategy (NDS). DT&E supports the NDS line of effort of Building a More Lethal Force by continuously engaging with programs throughout the acquisition lifecycle with the goal of helping them to succeed and providing acquisition leaders timely decision-quality information of demonstrated program performance before major program reviews for fielding modernized key capabilities to the warfighter. The DT&E program element supports the NDS reforming the Department for Greater Performance and Affordability line of effort through streamlining T&E policy and guidance for legacy and rapid acquisition programs to reduce acquisition cost, schedule, and performance risks and enhancing the experience and qualification of the 8,700 (+) DoD T&E workforce to support priority emerging technologies.

The DT&E program element is budgeted in the Research Development Test and Evaluation (RDT&E) budget activity to support and improve the DT&E efforts of Major Defense Acquisition Program (MDAP), Major Automated Information System (MAIS) / Priority Defense Business Systems, Rapid Fielding efforts, and other Special Interest (SI) acquisition programs designated by OUSD(R&E) as they progress through the acquisition/development lifecycle; Lead the Test and Evaluation (T&E) career field of the defense acquisition workforce; develop policy and guidance for the conduct of DT&E within the DoD; and prepare reports to Congress as required.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I</i> BA 6: <i>RDT&E Management Support</i>	R-1 Program Element (Number/Name) PE 0605804D8Z <i>I Development Test & Evaluation</i>
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B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	20.571	20.179	20.261	-	20.261
Current President's Budget	19.810	20.133	22.203	-	22.203
Total Adjustments	-0.761	-0.046	1.942	-	1.942
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.721	-			
• FFRDC Reduction	-0.040	-0.046	-	-	-
• Other Program Adjustments	-	-	-0.058	-	-0.058
• Scientific Test and Analysis Techniques Center of Excellence Sustainment	-	-	2.000	-	2.000

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
804: Development Test & Evaluation	79.102	19.810	20.133	22.203	-	22.203	22.249	22.592	20.977	21.422	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project provides resources to support Acquisition 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 manages the Test & Evaluation (T&E) career field and curriculum for the DoD acquisition workforce, develops policy and guidance for the conduct of DT&E within DoD, and prepares reports to Congress as required. On behalf of the USD(R&E) this project executes the following activities:

- Develop policy and guidance to ensure 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).
- Review and oversee developmental test processes across the services, especially during the formative stages of programs, to include prototyping and experimentation.
- Ensures that developmental test strategies beginning at Milestone A, are documented in Test and Evaluation Master Plans (TEMPs). Reviews and approves/disapproves the developmental test and evaluation strategy/plans within TEMPs.
- Provide DT&E subject matter experts to assist programs in constructing Developmental Evaluation Frameworks (DEFs) for inclusion in the TEMP.
- Provide cybersecurity subject matter experts to assist programs in focusing DT&E efforts to identify potential threat vectors and associated risks early in development.
- 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.
- Support rapid prototyping, rapid fielding, and technology demonstrations efforts in the development of tailored Middle Tier of Acquisition DT&E strategies/plans.
- Serve as the Functional Leader for the T&E acquisition career field. Establish, oversee, and maintain the education, training, and experience requirements including competencies and certification standards to enhance the T&E acquisition workforce. Monitor and facilitate Defense Acquisition University (DAU) updates of T&E courses to ensure the curriculum supports the certification standards and provides the appropriate education and training.
- Manage the Scientific Test and Analysis Techniques Center of Excellence (STAT COE). Over the last four years, the STAT COE has supported over 40 Acquisition Program Managers in the development of statistically optimized test programs. These efforts have resulted in 175 more efficient and effective test plans and a test cost avoidance of about \$160M.
- Coordinate with the Test Resources Management Center (TRMC) to identify DoD test infrastructure gaps and support development of the TRMC strategic plan.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense				Date: February 2019		
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 the Deputy Director for Mission Engineering & Integration (ME&I) to ensure that the DT&E activities of the DoD are fully integrated into, and consistent with, the ME&I and development planning processes of the Department.						
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Development Test and Evaluation		19.810	20.133	22.203	0.000	22.203
Description: This program supports and improves the DT&E efforts of Major Defense Acquisition Program (MDAP), Major Automated Information System (MAIS) /Business System Category Programs, and other Special Interest (SI) acquisition programs as they progress through the acquisition/development lifecycle; oversee the Test and Evaluation (T&E) career field of the defense acquisition workforce; develop policy and guidance for the conduct of DT&E within the DoD; and prepare DT&E reports to Congress.						
FY 2019 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 implement the DT&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.						
- Review/approve all TEMPs submitted to support milestone reviews. Ensure DT&E planning is complete prior to the start of DT&E activities.						
- Refine DT&E policies and methodologies addressing DT&E across all Acquisition programs.						
- Publish independent DT&E Sufficiency Assessments for ACAT ID MDAP programs 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.						
- Support USD (R&E) by developing DT&E related policy & guidance.						
- Convene the T&E Key Leadership Position Certification Board to review T&E key leadership candidates.						
- Serve as Functional Leader of the T&E acquisition workforce.						
- Review the DAU T&E education, training, and experience requirements including competencies and certification standards; position category description(s); and content of the DAU courses. Provide direction on needed changes.						

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense				Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
<p>- Manage the Scientific Test and Analysis Techniques Center of Excellence (STAT COE) and work with the Services to identify funding to sustain the STAT COE.</p> <p>- Prepare reports to Congress as required.</p> <p>FY 2020 Base Plans:</p> <p>- 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).</p> <p>- Continue to implement the DT&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.</p> <p>- Review/approve all TEMPs submitted to support milestone reviews. Ensure DT&E planning is complete prior to the start of DT&E activities.</p> <p>- Refine DT&E policies and methodologies addressing DT&E across all Acquisition programs.</p> <p>- 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.</p> <p>- 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..</p> <p>- Promote the application of sound DT&E and related technical disciplines across the Department's acquisition community and programs.</p> <p>- Convene the T&E Key Leadership Position Certification Board to review T&E key leadership candidates.</p> <p>- Serve as Functional Leader of the T&E acquisition workforce.</p> <p>- Review the DAU T&E education, training, and experience requirements including competencies and certification standards; position category description(s); and content of the DAU courses. Provide direction on needed changes.</p> <p>- Prepare required reports to Congress.</p> <p>FY 2020 OCO Plans:</p> <p>N/A.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement:</p> <p>Realignment of program priorities.</p>						
Accomplishments/Planned Programs Subtotals		19.810	20.133	22.203	0.000	22.203

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0605804D8Z / <i>Development Test & Evaluation</i>	Project (Number/Name) 804 / <i>Development Test & Evaluation</i>

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

N/A

Remarks

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

- Engaged with Program Managers and Chief Developmental Testers to develop and review developmental test strategies on all A&S-designated MDAP, MAIS, and SI programs.
- Advised Milestone Decision Authorities at Defense Acquisition Board (DAB), Overarching Integrated Product Teams (OIPT), and Nunn-McCurdy Reviews or other reviews.
- Reviewed DT&E strategy in Test and Evaluation Master Plans (TEMPs) for MDAP, MAIS, and Special Interest programs.
- Prepared formal DT&E assessments to inform Acquisition decision makers of readiness to enter EMD or begin Low Rate Initial Production.
- Supported OSD led Peer Reviews.
- The Scientific Test and Analysis Techniques Center of Excellence (STAT COE) supported development of disciplined test strategies.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I</i> BA 6: <i>RDT&E Management Support</i>	R-1 Program Element (Number/Name) PE 0606100D8Z <i>I Budget and Program Assessments</i>
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	30.443	3.838	5.755	8.017	-	8.017	10.099	12.164	10.237	8.327	Continuing	Continuing
101: <i>Budget and Program Assessments</i>	30.443	3.838	3.963	4.017	-	4.017	4.099	4.164	4.237	4.327	Continuing	Continuing
107: <i>Internet DMZ Migration</i>	0.000	0.000	1.792	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
118: <i>Enterprise VAMOSC</i>	-	0.000	0.000	4.000	-	4.000	6.000	8.000	6.000	4.000	Continuing	Continuing

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, 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 is focused 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 the senior leadership's deliberations and decision-making.

This program provides the scientific and technical engineering services needed for research studies in the development of models and simulations and the evaluation of current analytical tools and scientific methods used to evaluate and assess weapons systems and warfighting capabilities for warfighting environments and scenarios, and related force structure. Deliverables from this program will include reports, briefings, and analyses designed to illuminate critical issues facing the Department. Outcomes include recommendations for new modeling techniques, programmatic alternatives, and scenario development.

In FY 2019 CAPE received increased funding from the DoD Joint Service Provider to support the migration, implementation, and sustainment of its DoD Non-Classified Internet Protocol Router Network Demilitarized Zone (DMZ) efforts. In addition to the one-year increased RDT&E funding in FY 2019 described in this exhibit, CAPE also received additional Procurement and Operation and Maintenance (O&M) funding throughout the FY 2019-2023 FYDP to support the migration and sustainment of these developmental solutions. CAPE's funds are included in the total Internet DMZ Migration amount transferred from JSP to OSD so that CAPE and three other affected OSD Principal Staff Assistants (PSAs) can execute their own long-term solutions outside of the JSP DMZ.

The FY 2020 budget proposal includes additional resources to support the Enterprise Viability and Maintainability of Operation and Support Costs (EVAMOSC). 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

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I</i> BA 6: <i>RDT&E Management Support</i>	R-1 Program Element (Number/Name) PE 0606100D8Z <i>I Budget and Program Assessments</i>
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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.

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	3.984	5.768	4.017	-	4.017
Current President's Budget	3.838	5.755	8.017	-	8.017
Total Adjustments	-0.146	-0.013	4.000	-	4.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.146	-			
• FFRDC Redux	0.000	-0.013	0.000	0.000	0.000
• Enterprise VAMOSC (eVAMOSC)	-	-	4.000	-	4.000

Change Summary Explanation

The FY 2019 column reflects final congressional enactment action as well as SBIR/STTR Transfer. Outyear numbers reflect fiscal guidance, revised inflation guidance, and programmatic increases. The FY 2020 funding increase reflects direction for CAPE to develop and maintain a database of actual operating and support costs for major weapons systems, to be known as EVAMOSC. In addition to the FY 2020 RDT&E funding for EVAMOSC described in this exhibit, CAPE also received additional Operation and Maintenance (O&M) funding in FY 2023 and FY 2024 to support EVAMOSC operational efforts. These funds will enable CAPE to develop and maintain a reference database of actual operating and support (O&S) costs for major weapons systems.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
101: Budget and Program Assessments	30.443	3.838	3.963	4.017	-	4.017	4.099	4.164	4.237	4.327	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This program supports the Office of the Director, Cost Assessment & Program Evaluation (CAPE). It funds assessments that help to resolve budget and programmatic issues across the full range of the Department's activities. Projects that support this effort help to inform the leadership on program alternatives, capability concept development, design and cost, the appropriate balance of capabilities across the force, and also to identify how well the Department's expenditures are meeting its goals, and how well the force can implement the Defense strategy.

This program provides for analytical research across the entire spectrum of defense issues and concerns. The research agenda is focused 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 2018	FY 2019	FY 2020
Title: OSD Support for Programming Budget	3.838	3.963	4.017
Description: This program provides for analytical research across the entire spectrum of defense issues and concerns. The research agenda is focused 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 2019 Plans: Studies, analyses, and assessments will be focused on: <ul style="list-style-type: none"> - Improving cost analysis tools to inform program, budget, and Defense Acquisition Board reviews. - In support of the Weapon System Acquisition Reform Act (WSARA), 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. 			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0606100D8Z / <i>Budget and Program Assessments</i>	Project (Number/Name) 101 / <i>Budget and Program Assessments</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<ul style="list-style-type: none"> - Developing, assessing, and enhancing databases that provide cost data for major weapon systems. - 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. - Modifying and supporting a wargaming repository. - 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. <p>FY 2020 Plans: Studies, analyses, and assessments will be focused on:</p> <ul style="list-style-type: none"> - Improving cost analysis tools to inform program, budget, and Defense Acquisition Board reviews. - In support of the Weapon System Acquisition Reform Act (WSARA), 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. - 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. - Modifying and supporting a wargaming repository. - 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. <p>FY 2019 to FY 2020 Increase/Decrease Statement:</p>			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0606100D8Z / <i>Budget and Program Assessments</i>	Project (Number/Name) 101 / <i>Budget and Program Assessments</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
FY 2020 funding levels are virtually steady-state, except for additional resources directed to develop and maintain an enterprise database of actual operating and support costs. CAPE RDT&E resources will fund a mix of research activities to carry out the plans stated above.			
Accomplishments/Planned Programs Subtotals		3.838	4.017
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).			
E. Performance Metrics The products or expected outcomes of this program are studies and analyses to support resource allocation decisions, major defense acquisition decisions, and issues of high interest to the Secretary of Defense. Performance is measured by the quality of the analyses and is monitored through the review of the organizational assessment process. The primary goal is to ensure that study and analytical products are timely, clear, complete, accurate, responsive, balanced, and objective.			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 6					R-1 Program Element (Number/Name) PE 0606100D8Z / Budget and Program Assessments				Project (Number/Name) 107 / Internet DMZ Migration			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
107: Internet DMZ Migration	0.000	0.000	1.792	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Internet DMZ Migration reflects CAPE activities as part of a broader DoD effort to provide additional funds to Office of the Secretary of Defense (OSD) Principal Staff Assistants to enable them to migrate, implement, and sustain their DoD Non-classified Internet Protocol Router Network Demilitarized Zones (DMZ) efforts. CAPE's RDT&E funds supported initial cloud development and conversion costs in FY 2019. This RDT&E funding was for FY 2019 only.

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
<p>Title: Internet DMZ Migration</p> <p>Description: In FY 2019 CAPE received increased funding from the DoD Joint Service Provider to support the migration, implementation, and sustainment of its DoD Non-Classified Internet Protocol Router Network Demilitarized Zone (DMZ) efforts. In addition to the increased RDT&E funding described in this exhibit, CAPE also received additional Procurement and Operation and Maintenance (O&M) funding to support the migration and ongoing sustainment of these developmental efforts. CAPE's funds were included in the total Internet DMZ Migration amount transferred from JSP to OSD so that CAPE and three other affected OSD Principal Staff Assistants (PSAs) could execute their own long-term solutions outside of the JSP DMZ.</p> <p>FY 2019 Plans: Initial cloud development and conversion.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: One-year funding (FY 2019 only)</p>	0.000	1.792	-
Accomplishments/Planned Programs Subtotals	0.000	1.792	-

C. Other Program Funding Summary (\$ in Millions)
N/A

Remarks

D. Acquisition Strategy
N/A for FY 2020 and beyond

E. Performance Metrics
N/A for FY 2020 and beyond.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 6					R-1 Program Element (Number/Name) PE 0606100D8Z / <i>Budget and Program Assessments</i>				Project (Number/Name) 118 / <i>Enterprise VAMOSC</i>			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
118: <i>Enterprise VAMOSC</i>	-	0.000	0.000	4.000	-	4.000	6.000	8.000	6.000	4.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Enterprise VAMOSC addresses CAPE's responsibility to develop and maintain a database of actual operating and support (O&S) costs for major weapons systems, as required in 10 USC Ch. 137, Sec. 2337a and further refined by Sec. 832 of the 2019 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 2018	FY 2019	FY 2020
<p>Title: Enterprise Visibility and Maintainability of Operating and Support Costs</p> <p>Description: Enterprise VAMOSC addresses CAPE's responsibility to develop and maintain a database of actual operating and support (O&S) costs for major weapons systems, as required in 10 USC Ch. 137, Sec. 2337a and further refined by Sec. 832 of the 2019 NDAA. Additionally, the EVAMOSC data capability will directly support development and reporting of readiness metrics associated with implementation of the National Defense Strategy.</p> <p>FY 2019 Plans: This is a new project in FY 2020</p> <p>FY 2020 Plans:</p> <ul style="list-style-type: none"> • Analyze gaps in current weapons system O&S data and refine the DoD's enterprise-level O&S data map • Develop business rules, data dictionaries, and governance to support collection and reporting of enterprise-level O&S cost data • Identify and develop processing, data analysis, general functionality, and system use requirements for an enterprise-level O&S cost data capability <p>FY 2019 to FY 2020 Increase/Decrease Statement: FY 2020 funding reflects new resources provided specifically for EVAMOSC. There was no FY 2019 funding for this project.</p>	0.000	0.000	4.000
Accomplishments/Planned Programs Subtotals	0.000	0.000	4.000

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

N/A

Remarks

N/A

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0606100D8Z / Budget and Program Assessments	Project (Number/Name) 118 / Enterprise VAMOSC
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).		
E. Performance Metrics The products or expected outcomes of this program are an authoritative reference DoD enterprise database of actual operating and support (O&S) costs for major weapons systems to inform senior departmental decisionmakers. Performance is measured by the quality and reliability of the operating and support cost data and is monitored through an ongoing validation and assessment process. The primary goal is to ensure that the data and analytical products are timely, clear, complete, accurate, responsive, balanced, and objective.		

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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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 & Research Analysis
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	3.500	0.998	1.028	3.194	-	3.194	4.383	6.044	8.075	10.458	Continuing	Continuing
106: Technology and Research Analysis	3.500	0.998	1.028	3.194	-	3.194	4.383	6.044	8.075	10.458	Continuing	Continuing

A. Mission Description and Budget Item Justification

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	1.000	1.030	1.061	-	1.061
Current President's Budget	0.998	1.028	3.194	-	3.194
Total Adjustments	-0.002	-0.002	2.133	-	2.133
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• FFRDC	-0.002	-0.002	-	-	-
• Program Changes	-	-	2.133	-	2.133

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 6					R-1 Program Element (Number/Name) PE 0606225D8Z / ODNA Technology & Research Analysis				Project (Number/Name) 106 / Technology and Research Analysis			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
106: Technology and Research Analysis	3.500	0.998	1.028	3.194	-	3.194	4.383	6.044	8.075	10.458	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		
A. Mission Description and Budget Item Justification												
The Office of Net Assessment develops and coordinates analyses that examine the standing trends and future prospects of U.S. and other military capabilities and military potential. The net assessments address near and long-term problems and opportunities for the U.S. military forces to help counter technological advantages of potential adversaries of the United States. These efforts will pursue research to analyze the future security environment.												
B. Accomplishments/Planned Programs (\$ in Millions)									FY 2018	FY 2019	FY 2020	
Title: Technology and Research Analysis									0.998	1.028	3.194	
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 2019 Plans:												
- Continue analysis on future concepts of operation and possible courses of action and responses to emerging capabilities.												
- Continue investment in a Biosciences Net Assessment and Human Machine Teaming to assess potential revolutionary advances.												
- Continue analysis in AI to identify areas of consideration for potential advanced capability demonstrations.												
FY 2020 Plans:												
Continue and initiate efforts to pursue research that analyzes the future security environment, including:												
- Continue analysis on future concepts of operation and possible courses of action and responses to emerging capabilities.												
- Continue investment in a Biosciences Net Assessment and initiate analysis in future warfare areas to assess potential revolutionary advances.												
- Continue analysis in AI to identify areas of consideration for potential advanced capability demonstrations.												
FY 2019 to FY 2020 Increase/Decrease Statement:												
Increase for program continuation												
Accomplishments/Planned Programs Subtotals									0.998	1.028	3.194	

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0606225D8Z / <i>ODNA Technology & Research Analysis</i>	Project (Number/Name) 106 / <i>Technology and Research Analysis</i>
C. Other Program Funding Summary (\$ in Millions) N/A		
Remarks		
D. Acquisition Strategy N/A		
E. Performance Metrics N/A		

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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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)
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	2.070	5.479	9.985	3.037	-	3.037	3.099	3.164	3.180	3.248	Continuing	Continuing
345: Defense Operations Security Initiative	2.070	5.479	9.985	3.037	-	3.037	3.099	3.164	3.180	3.248	Continuing	Continuing

Program MDAP/MAIS Code:
Project MDAP/MAIS Code(s): 003

A. Mission Description and Budget Item Justification

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	2.551	3.008	3.046	-	3.046
Current President's Budget	5.479	9.985	3.037	-	3.037
Total Adjustments	2.928	6.977	-0.009	-	-0.009
• Congressional General Reductions	-0.005	-0.023			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	3.000	7.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.067	-			
• Departmental Decrease	-	-	-0.009	-	-0.009

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

Project: 345: Defense Operations Security Initiative

Congressional Add: Cyber Kinetic Range Capabilities

	FY 2018	FY 2019
	3.000	7.000
Congressional Add Subtotals for Project: 345	3.000	7.000
Congressional Add Totals for all Projects	3.000	7.000

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
345: Defense Operations Security Initiative	2.070	5.479	9.985	3.037	-	3.037	3.099	3.164	3.180	3.248	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		
Project MDAP/MAIS Code: 003												
A. Mission Description and Budget Item Justification												
DOSI establishes and leads the Department's next generation Operations Security (OPSEC) capability development and affiliated investment strategy. Investments support DoD's current and emerging OPSEC capability gaps, including countering advances in non-U.S. Intelligence, Surveillance, and Reconnaissance (ISR) capabilities and denying the understanding of U.S. capability, capacity, and readiness 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 2018	FY 2019	FY 2020	
Title: Defense Operations Security Initiative									2.479	2.985	3.037	
Description: RDT&E investments focus on countering advances in non-U.S. ISR capabilities and denying understanding of U.S. capability, capacity, and readiness. These investments spur Department innovation and preserve U.S. information and technology superiority. DOSI's analyses and engineering activities lead the OPSEC community's ability to sustain and maximize technological advantages.												
FY 2019 Plans:												
- Oversee research, development, and testing on next generation capabilities that counter foreign ISR capabilities and deny understanding of U.S. capability, capacity and readiness.												
- 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 2020 Plans:												
- Continue to oversee research, development, and testing on next generation capabilities that counter foreign ISR capabilities and deny understanding of U.S. capability, capacity and readiness.												
- Continue to provide oversight and advocacy for transitioning developed capabilities into formalized program offices and program executive offices across DoD Components.												

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019	
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 2018	FY 2019	FY 2020	
- 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 2019 to FY 2020 Increase/Decrease Statement: No significant change.											
Accomplishments/Planned Programs Subtotals								2.479	2.985	3.037	
						FY 2018	FY 2019				
Congressional Add: Cyber Kinetic Range Capabilities						3.000	7.000				
FY 2018 Accomplishments: - Identified New Mexico Tech's Playas Training and Research Center (PTRC) as a facility of interest in the execution of the Cyber Kinetic Combat Environment activities. - Coordinated with Air Combat Command (ACC) and USCYBERCOM to initiate program planning and execution at PTRC. - Initiated proof of concept employment of ACC Electronic Warfare assets at the Playas Research and Training Center (PTRC). - Developed initial plan for long lead-time improvement to the PTRC facility to facilitate future test and cyber training events.											
FY 2019 Plans: - Development of Playas Training and Research Center (PTRC) as a facility of interest in the execution of the Cyber Kinetic Combat Environment activities.											
Congressional Adds Subtotals						3.000	7.000				
C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• 0203345D8Z O&M DW: Defense Operations Security Initiative	2.436	3.539	3.917	-	3.917	3.989	3.989	4.063	4.384	Continuing	Continuing
Remarks											
D. Acquisition Strategy											
The acquisition, management, and contracting strategy involves the following:											
• Adhere to guidance outlined in DoD 5000, Directive 7, Federal Acquisition Regulations (FAR), and FAR Supplement Policies and Procedures.											
• RDT&E OPSEC capabilities, systems, tools, products, and services through a disciplined, yet agile, process that ensures signature management and signature obfuscation capabilities are available for DoD components.											

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0203345D8Z / <i>Defense Operations Security Initiative (DOSI)</i>	Project (Number/Name) 345 / <i>Defense Operations Security Initiative</i>
<ul style="list-style-type: none"> • 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. 		
<p><u>E. Performance Metrics</u></p> <p>RDT&E performance metrics are used to establish baseline and assess progress toward enhancement and increase of OPSEC capabilities and capacities across the DoD's assigned responsibilities. The following metrics are based on the ROI of RDT&E investments and provide assessment to meeting:</p> <p>1) operational requirements for OPSEC capabilities, 2) technical requirements for successful engineering, and 3) programmatic requirements for sustaining RDT&E successes across the Department:</p> <ul style="list-style-type: none"> - Seventy percent of evaluations and tests on engineered next generation capabilities address Combatant Commander and/or DoD Component requirements. The remaining thirty percent serve as the pivot to improve service level operational capabilities or to address alternate technologies. - One hundred percent of completed capabilities include affiliated specifications, architecture, raw material inventories and documentation. They are maintained in a centralized database repository used to support feedback and future efforts. - Fifty percent of next generation capabilities transition into DoD Component Program Management Offices and Program Executive Offices to fulfill DoD urgent needs, while the remaining fifty percent are reviewed for alternative operational utility and sent to the appropriate Service or Agency for application. 		

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	0.898	0.977	1.003	1.014	-	1.014	1.036	1.048	1.063	1.086	Continuing	Continuing
891: Defense Military Deception Program	0.898	0.977	1.003	1.014	-	1.014	1.036	1.048	1.063	1.086	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

DMDPO establishes and leads the Department's next generation physical and electromagnetic decoys capability and affiliated investment strategy. Investments support DoD's current and emerging Military Deception (MILDEC) capability gaps, including multi-spectrum signature emulation. These investments spur technology innovation maximizing Joint Force Commanders' ability to reduce operational risks across system survivability and force protection while maximizing the ability to dictate operational conditions such as freedom of maneuver, positional advantage, and initiative. R&D capabilities are transitioned to Service and Agency programs for sustainment, maintenance, and capacity programming. Test and evaluation analyses establish Department requirement forecasts on capability programming.

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	1.006	1.005	1.017	-	1.017
Current President's Budget	0.977	1.003	1.014	-	1.014
Total Adjustments	-0.029	-0.002	-0.003	-	-0.003
• Congressional General Reductions	-0.002	-0.002			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.027	-			
• Departmental Decrease	-	-	-0.003	-	-0.003

C. Accomplishments/Planned Programs (\$ in Millions)

Title: Defense Military Deception Program Office	FY 2018	FY 2019	FY 2020
FY 2019 Plans: - Oversee research, development and testing on high-fidelity next generation decoys affiliated with current CCMD and Service requirements. - Provide oversight and advocacy for transitioning developed capabilities into formalized program offices and program executive offices across DoD Components.	0.977	1.003	1.014

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
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 2018	FY 2019	FY 2020
- Participate in Defense RDT&E processes to advance basic and applied research, science and technology, and technology development and testing to elevate MILDEC capability and capacity across the Department. FY 2020 Plans: - Continue to oversee research, development and testing on high-fidelity next generation decoys 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 MILDEC capability and capacity across the Department. FY 2019 to FY 2020 Increase/Decrease Statement: No significant change.			
Accomplishments/Planned Programs Subtotals	0.977	1.003	1.014

D. Other Program Funding Summary (\$ in Millions)											
<u>Line Item</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020</u> <u>Base</u>	<u>FY 2020</u> <u>OCO</u>	<u>FY 2020</u> <u>Total</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• 0303260D8Z O&M DW: Defense Military Deception Program Office	1.216	1.473	2.278	-	2.278	2.307	2.336	2.379	2.555	Continuing	Continuing
Remarks											
E. Acquisition Strategy											
The acquisition, management, and contracting strategy involves the following: • Adhere to guidance outlined in DoD 5000, Directive 7, Federal Acquisition Regulations (FAR), and FAR Supplement Policies and Procedures. • Acquire and sustain MILDEC 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 MILDEC activities.											
F. Performance Metrics											
RDT&E performance metrics are among the metrics used to establish the baseline and assess progress toward revitalization of MILDEC capabilities and capacities across the DoD's assigned responsibilities. The following metrics are based on the return on investment of RDT&E investments and provide assessment to meeting:											

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
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)	
<p>1) operational requirements for MILDEC capabilities, 2) technical requirements for successful engineering, and 3) programmatic requirements for sustaining RDT&E successes across the Department:</p> <p>- Seventy percent of evaluations and tests on engineered next generation capabilities address CCMD and DoD Component requirements. The remaining thirty percent serve as the pivot to improve service level operational capabilities or to address alternate technologies.</p> <p>- One hundred percent of completed capability development includes affiliated specifications, architecture, raw material inventories, and documentation. They are maintained in a centralized database repository used to support feedback and future efforts.</p> <p>- Fifty percent of next generation capabilities transition into DoD Component Program Management Offices and Program Executive Offices to fulfill DoD urgent needs, while the remaining fifty percent are reviewed for alternative operational utility and sent to the appropriate Service or Agency for application.</p>		

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I</i> BA 6: <i>RDT&E Management Support</i>					R-1 Program Element (Number/Name) PE 0305245D8Z <i>I Intelligence Capabilities and Innovation</i>							
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	0.000	15.255	189.529	21.081	-	21.081	20.640	19.851	20.167	20.597	Continuing	Continuing
245: <i>Innovation and MAVEN</i>	0.000	15.255	189.529	21.081	-	21.081	20.640	19.851	20.167	20.597	Continuing	Continuing

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.

ICI also funds Project Maven a rapid fielding Artificial Intelligence (AI) program to augment and automate Processing, Exploitation and Dissemination (PED) for full motion video Tactical Unmanned Aerial Vehicles (TUAVs), Medium Altitude, High Altitude, and Wide Area Motion Imagery (WAMI) ISR platforms in support of defeat-ISIS and National Defense Strategy (NDS) peer/near peer competitor strategy. Maven also brings AI to Captured Enemy Material (CEM), Acoustical Intelligence (ACINT), Overhead Persistent Infrared program (OPIR) and Public Available Information (PAI) exploitation. Maven uses AI, deep learning, and computer vision algorithms to detect, classify, and track objects within Full Motion Video (FMV) images (e.g., person, vehicle, and weapon) and other AI algorithms for CEM and text based projects. Maven algorithms increase the intelligence value of Intelligence, Surveillance and Reconnaissance (ISR), reduce the human burden of screening so analysts can multi-task increasing productivity, and seeds the generation of insight from GEOINT. Project Maven is a commercial technology initiative that inserts commercial AI into existing programs of records. Most military intelligence exploitation systems were designed pre-AI and require specialized integration to enable the insertion of algorithms into their software baseline. Project Maven is the pathfinder AI initiative for the DoD and is investing in critical AI architecture to support the rapid expansion of AI to other mission areas besides GEOINT. As Maven algorithms increase in capability, the algorithms will move to the edge (on the sensor platform). The MAVEN funding will move to the newly created Algorithmic Warfare Cross Functional Team, Program Element (PE) 0307588D8Z beginning in FY 2020.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I</i> BA 6: <i>RDT&E Management Support</i>	R-1 Program Element (Number/Name) PE 0305245D8Z <i>I Intelligence Capabilities and Innovation</i>
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B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	18.992	109.529	71.551	-	71.551
Current President's Budget	15.255	189.529	21.081	-	21.081
Total Adjustments	-3.737	80.000	-50.470	-	-50.470
• Congressional General Reductions	-0.037	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	80.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-3.700	-			
• SBIR/STTR Transfer	-	-			
• Departmental Adjustment	-	-	-50.470	-	-50.470

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

Project: 245: *Innovation and MAVEN*

Congressional Add: *Project Maven*

	FY 2018	FY 2019
	-	80.000
Congressional Add Subtotals for Project: 245	-	80.000
Congressional Add Totals for all Projects	-	80.000

Change Summary Explanation

MAVEN funding will move to the newly created Algorithmic Warfare Cross Functional Team PE 0307588D8Z beginning in FY 2020.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 6					R-1 Program Element (Number/Name) PE 0305245D8Z / Intelligence Capabilities and Innovation				Project (Number/Name) 245 / Innovation and MAVEN			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
245: Innovation and MAVEN	0.000	15.255	189.529	21.081	-	21.081	20.640	19.851	20.167	20.597	Continuing	Continuing
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.

ICI also funds Project Maven which fields increasing amounts of automation to FMV ground exploitation stations for UAVs, Medium Altitude, High Altitude ISR platforms and accelerates the development and deployment of AI capabilities across the Defense Intelligence Enterprise, including exploitation of CEM, ACINT, OPIR and PAI exploitation. Maven uses artificial intelligence, deep learning, and computer vision algorithms to detect, classify, and track objects within FMV images (e.g., person, vehicle, and weapon) and other AI algorithms for CEM and text based projects. Maven algorithms increase the intelligence value of ISR, reduce the human burden of screening so analysts can multi-task increasing productivity, and seeds the generation of insight from GEOINT. Project Maven is a commercial technology initiative that inserts commercial AI into existing programs of records. Most military intelligence exploitation systems were designed pre-AI and require specialized integration to enable the insertion of algorithms into their software baseline. Project Maven is the pathfinder AI initiative for the DoD and is investing in critical AI architecture to support the rapid expansion of AI to other mission areas besides GEOINT. As Maven algorithms increase in capability, the algorithms will move to the edge (on the sensor platform).

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
Title: ICI	15.255	109.529	21.081
FY 2019 Plans:			
Project ICI, develops Intelligence Capabilities and Innovation capabilities and capacity to support Combatant Commands, Combat Support Agencies, and Services to develop and prototype critical and emerging intelligence capabilities and innovation as well as emerging technology solutions in support of Defense Intelligence Enterprise gaps to include cyber, security and technical collection requirements.			
Project Maven uses Rapid prototype sprints to field increasing amounts of automation to FMV ground exploitation stations for UAVs, Medium Altitude and High Altitude ISR platforms. Maven uses artificial intelligence, deep learning, and computer vision algorithms to detect, classify, and track objects within FMV images (e.g., person, vehicle, and weapon). This initiative brings artificial intelligence, deep learning, and computer vision into the process of object detection, identification, and tracking at computer process speed versus human speed. Incorporating computer vision and algorithms will reduce the human burden and provide efficient and effective exploration of data. Project Maven develops algorithms focused on tactical UAV FMV Automatic			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0305245D8Z / <i>Intelligence Capabilities and Innovation</i>	Project (Number/Name) 245 / <i>Innovation and MAVEN</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>Target Recognition (ATR) and an operational PED environment for platforms and ground stations. AW builds capabilities, integrate AI and machine learning (ML) to provide actionable intelligence and enhance military decision-making by providing algorithms for object detection, classification and user alerts.</p> <p>FY 2020 Plans: Project ICI, continues to develop Intelligence Capabilities and Innovation capabilities and capacity to support Combatant Commands, Combat Support Agencies, and Services. New focus areas are aligned to the National Defense Strategy and meeting the Secretary of Defense goals to increase lethality for Department.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Decrease between FY 2019 and FY 2020 is due to the MAVEN funding moving to the newly created Algorithmic Warfare Cross Functional Team PE 0307588D8Z beginning in FY 2020.</p>			
Accomplishments/Planned Programs Subtotals		15.255	109.529
		FY 2018	FY 2019
Congressional Add: Project Maven		-	80.000
<p>FY 2019 Plans: Project Maven uses Rapid prototype sprints to field increasing amounts of automation to FMV ground exploitation stations for UAVs, Medium Altitude and High Altitude ISR platforms. Maven uses artificial intelligence, deep learning, and computer vision algorithms to detect, classify, and track objects within FMV images (e.g., person, vehicle, and weapon). Project Maven develops algorithms focused on tactical UAV FMV ATR and an operational PED environment for platforms and ground stations. Maven builds capabilities, integrate AI and ML to provide actionable intelligence and enhance military decision-making by providing algorithms for object detection, classification and user alerts.</p>			
Congressional Adds Subtotals		-	80.000
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.			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0305245D8Z / <i>Intelligence Capabilities and Innovation</i>	Project (Number/Name) 245 / <i>Innovation and MAVEN</i>
E. Performance Metrics <p>Performance Metrics are measured through internal management controls and external assessments. Performance metrics include, but are not limited to, time, money, realism, fidelity, and transition as defined below:</p> <ul style="list-style-type: none">• Time – Enable the warfighter to speed up processes faster than current capabilities allow.• Money – Enable the warfighter to reduce duplication of effort and to prepare and execute events at a more effective and efficient cost than current capabilities allow.• Realism – Enable the warfighter to create an environment that is close to the real world environment that current capabilities allow.• Fidelity – Ensure unity of efforts throughout the Intelligence Capabilities and Innovation communities.• Transition – Select projects that have the greatest likelihood of adoption and transition to operational capabilities.		

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity					R-1 Program Element (Number/Name)							
0400: Research, Development, Test & Evaluation, Defense-Wide / BA 6: RDT&E Management Support					PE 0306310D8Z / CWMD Systems: RDT&E Management Support							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	0.000	1.229	1.241	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
814: RDT&E Management Support	0.000	1.229	1.241	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

Note

Reduction from FY2019 to FY2020 the result of reallocation of resources to gain efficiencies following the elimination of BA-6 / PE#0306310D8Z and combination of O&M projects CWMD Sustainment with Threat Reduction and Arms Control.

A. Mission Description and Budget Item Justification

The Countering Weapons of Mass Destruction (CWMD) Systems program provides funding for research, development, integration, and deployment of CWMD capabilities. Funding is allocated to a portfolio of projects and activities in response to Combatant Command, joint, and Military Service capability needs and research initiatives. The CWMD Systems program supports 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 program is organized to develop, enhance, mature and transition technologies across the RDT&E continuum, from Advanced Technology Development through Operational Systems Development, as well as limited sustainment in unique cases. A focus area is investment in CWMD-related technologies that require additional development to transition to fielded capabilities, in response to validated, prioritized requirements. This effort fills a seam in which capability gaps are not being addressed adequately or sufficiently to meet warfighter needs. The CWMD Systems program closes gaps identified by specialized military units and leverages prior S&T investments to continue development and fielding of operational systems to those units.

The program’s legacy focus on CWMD situational awareness capabilities remains a significant component of the investment portfolio. U.S. Special Operations Command, which assumed CWMD mission responsibilities in January 2017 per the Unified Command Plan, is providing focus and guidance for development of CWMD situational awareness capabilities. The CWMD Systems program funds initiatives to close CWMD situational awareness gaps by leveraging mature technologies, modifying existing systems, and utilizing technology-enabled analytical cells to provide support to Combatant Commands and other joint and Service commands. These cells curate, synthesize, and contextualize CWMD information for end-users. This hybrid approach facilitates cross-organizational information sharing and collaboration, necessary for addressing the trans regional character of WMD proliferation.

During FY 2018 and FY 2019 the CWMD Systems program utilized four Research, Development, Test & Evaluation (RDT&E) program elements (BA-3 / PE#0303310D8Z, BA-5 / PE#0305310D8Z, BA-6 / PE#0306310D8Z, and BA-7 / PE#0607310D8Z), as well as an Operations and Maintenance (O&M) "CWMD Sustainment" line (PE#0901388D8Z ORC-2531). Reallocation of resources beginning in FY 2020 will eliminate the BA-6 / PE#0306310D8Z program element and address O&M requirements with the "Threat Reduction and Arms Control" line (PE#0901388D8Z ORC-3501).

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide / BA 6: RDT&E Management Support</i>	R-1 Program Element (Number/Name) PE 0306310D8Z / <i>CWMD Systems: RDT&E Management Support</i>
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This Program Element (PE) funds research, development, test and evaluations efforts to support planning, development, and sustainment of CWMD technologies, including situational awareness information systems, or other systems as needed.

This appropriation funds travel to support the requirements of this program, and 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, development and test and evaluation efforts.

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	1.231	1.244	1.273	-	1.273
Current President's Budget	1.229	1.241	0.000	-	0.000
Total Adjustments	-0.002	-0.003	-1.273	-	-1.273
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• FFRDC reduction	-0.002	-0.003	-	-	-
• Reallocation to other CWMD Systems PE's	-	-	-1.273	-	-1.273

Change Summary Explanation

Reduction from FY2019 to FY2020 the result of reallocation of resources to gain efficiencies following the elimination of BA-6 / PE#0306310D8Z and combination of O&M projects CWMD Sustainment with Threat Reduction and Arms Control.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 6					R-1 Program Element (Number/Name) PE 0306310D8Z / CWMD Systems: RDT&E Management Support				Project (Number/Name) 814 / RDT&E Management Support			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
814: RDT&E Management Support	0.000	1.229	1.241	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Reduction from FY2019 to FY2020 the result of reallocation of resources to gain efficiencies following the elimination of BA-6 / PE#0306310D8Z and combination of O&M projects CWMD Sustainment with Threat Reduction and Arms Control.

A. Mission Description and Budget Item Justification

The Countering Weapons of Mass Destruction (CWMD) Systems program provides funding for research, development, integration, and deployment of CWMD capabilities. Funding is allocated to a portfolio of projects and activities in response to Combatant Command, joint, and Military Service capability needs and research initiatives.

The CWMD Systems program is organized to develop, enhance, mature and transition technologies across the RDT&E continuum, from Advanced Technology Development through Operational Systems Development, as well as limited sustainment in unique cases. A focus area is investment in CWMD-related technologies that require additional development to transition to fielded capabilities, in response to validated, prioritized requirements. This effort fills a seam in which capability gaps are not being addressed adequately or sufficiently to meet warfighter needs. The CWMD Systems program closes gaps identified by specialized military units and leverages prior S&T investments to continue development and fielding of operational systems to those units.

The program's legacy focus on CWMD situational awareness capabilities remains a significant component of the investment portfolio. U.S. Special Operations Command, which assumed CWMD mission responsibilities in January 2017 per the Unified Command Plan, is providing focus and guidance for development of CWMD situational awareness capabilities. The CWMD Systems program funds initiatives to close CWMD situational awareness gaps by leveraging mature technologies, modifying existing systems, and utilizing technology-enabled analytical cells to provide support to Combatant Commands and other joint and Service commands. These cells curate, synthesize, and contextualize CWMD information for end-users. This hybrid approach facilitates cross-organizational information sharing and collaboration, necessary for addressing the transregional character of WMD proliferation.

During FY 2018 and FY 2019 the CWMD Systems program utilized four Research, Development, Test & Evaluation (RDT&E) program elements (BA-3 / PE#0303310D8Z, BA-5 / PE#0305310D8Z, BA-6 / PE#0306310D8Z, and BA-7 / PE#0607310D8Z), as well as an Operations and Maintenance (O&M) "CWMD Sustainment" line (PE#0901388D8Z ORC-2531). Reallocation of resources beginning in FY 2020 will eliminate the BA-6 / PE#0306310D8Z program element and address O&M requirements with the "Threat Reduction and Arms Control" line (PE#0901388D8Z ORC-3501).

This project funds research, development, test and evaluations efforts to support planning, development, and sustainment of CWMD technologies, including situational awareness information systems, or other systems as needed.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 6	R-1 Program Element (Number/Name) PE 0306310D8Z / CWMD Systems: RDT&E Management Support	Project (Number/Name) 814 / RDT&E Management Support	
<p>This appropriation funds travel to support the requirements of this program, and 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, development and test and evaluation efforts.</p>			
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>Title: P814 / RDT&E Management</p> <p>Description: Perform activities to support the planning, development, and sustainment of CWMD technologies, including situational awareness information systems, or other systems as needed.</p> <p>FY 2019 Plans:</p> <ul style="list-style-type: none"> • Perform studies and analyses to support the planning, development, and sustainment of CWMD technologies, include situational awareness information systems • Evaluate CWMD-related technologies under consideration for further development, testing, and fielding against validated requirements <p>FY 2020 Plans: None. PE eliminated.</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement: Reduction from FY2019 to FY2020 the result of reallocation of resources to gain efficiencies following the elimination of BA-6 / PE#0306310D8Z and combination of O&M projects CWMD Sustainment with Threat Reduction and Arms Control.</p>		1.229	1.241
Accomplishments/Planned Programs Subtotals		1.229	1.241
C. Other Program Funding Summary (\$ in Millions) N/A			
Remarks			
D. Acquisition Strategy Utilize or reuse information technologies to field initial capabilities to end-users. As technologies mature and user needs are refined, systems or applications may transition to acquisition program(s) or be sustained separately. Integration of or interoperability among systems is also an acquisition pathway.			
E. Performance Metrics Success in this area is measured by compliance with various statutes and DoD directives that govern the conduct of the affairs within the Office of the Assistant Secretary of Defense for Nuclear, Chemical and Biological Defense Programs (OASD/NCB). Maintain cost, schedule, and performance reporting, review, and adjudication. Maintain requirements traceability matrix.			

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity	R-1 Program Element (Number/Name)											
0400: Research, Development, Test & Evaluation, Defense-Wide / BA 6: RDT&E Management Support	PE 0307588D8Z / Algorithmic Warfare Cross Functional Team (AWCFT)											
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	0.000	0.000	0.000	221.235	0.000	221.235	45.261	45.234	45.193	46.255	Continuing	Continuing
590: Algorithmic Warfare Cross Functional Team (AWCFT)	0.000	0.000	0.000	221.235	0.000	221.235	45.261	45.234	45.193	46.255	Continuing	Continuing

A. Mission Description and Budget Item Justification

Algorithmic Warfare Cross Functional Team (AWCFT) funds Project Maven, a rapid fielding Artificial Intelligence (AI) program to augment and automate Processing, Exploitation and Dissemination (PED) for Full Motion Video (FMV) Tactical Unmanned Aerial Vehicles (TUAVs), Medium Altitude, High Altitude, and Wide Area Motion Imagery (WAMI) Intelligence, Surveillance and Reconnaissance (ISR) platforms in support of defeat-ISIS and National Defense Strategy (NDS) peer/near peer competitor strategy. Maven also brings AI to Captured Enemy Material (CEM), Acoustical Intelligence (ACINT), Overhead Persistent Infrared program (OPIR) and Public Available Information (PAI) exploitation. Maven uses AI, deep learning, and computer vision algorithms to detect, classify, and track objects within FMV images (e.g., person, vehicle, and weapon) and other AI algorithms for CEM and text based projects. Maven algorithms increase the intelligence value of ISR, reduce the human burden of screening so analysts can multi-task increasing productivity, and seeds the generation of insight from Geospatial Intelligence (GEOINT). Project Maven is a commercial technology initiative that inserts commercial AI into existing programs of records. Most military intelligence exploitation systems were designed pre-AI and require specialized integration to enable the insertion of algorithms into their software baseline. Project Maven is the pathfinder AI initiative for the DoD and is investing in critical AI architecture to support the rapid expansion of AI to other mission areas besides GEOINT. As Maven algorithms increase in capability, the algorithms will move to the edge (on the sensor platform).

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	0.000	0.000	0.000	0.000	0.000
Current President's Budget	0.000	0.000	221.235	0.000	221.235
Total Adjustments	0.000	0.000	221.235	0.000	221.235
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Departmental Adjustment	0.000	0.000	221.235	0.000	221.235

Change Summary Explanation

In order to delineate funding designation and mission execution, Algorithmic Warfare Cross Functional Teams (Maven) was transferred from PE 0305245D8Z to PE0307588D8Z beginning in FY 2020. In addition, the department increased FY 2020 across all appropriations in order for the DoD to invest in critical AI

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
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)	
<p>architecture to support the rapid expansion of AI to other mission areas besides GEOINT. As Maven algorithms increase in capability, the algorithms will move to the edge (on the sensor platform).</p>		

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
590: Algorithmic Warfare Cross Functional Team (AWCFT)	0.000	0.000	0.000	221.235	0.000	221.235	45.261	45.234	45.193	46.255	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Algorithmic Warfare Cross Functional Team funds Project Maven which fields increasing amounts of automation to FMV ground exploitation stations for UAVs, Medium Altitude, High Altitude ISR platforms and accelerates the development and deployment of AI capabilities across the Defense Intelligence Enterprise, including exploitation of CEM, ACINT, OPIR and PAI exploitation. Maven uses artificial intelligence, deep learning, and computer vision algorithms to detect, classify, and track objects within FMV images (e.g., person, vehicle, and weapon) and other AI algorithms for CEM and text based projects. Maven algorithms increase the intelligence value of ISR, reduce the human burden of screening so analysts can multi-task increasing productivity, and seeds the generation of insight from GEOINT. Project Maven is a commercial technology initiative that inserts commercial AI into existing programs of records. Most military intelligence exploitation systems were designed pre-AI and require specialized integration to enable the insertion of algorithms into their software baseline. Project Maven is the pathfinder AI initiative for the DoD and is investing in critical AI architecture to support the rapid expansion of AI to other mission areas besides GEOINT. As Maven algorithms increase in capability, the algorithms will move to the edge (on the sensor platform).

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Algorithmic Warfare Cross Functional Team (AWCFT)	0.000	0.000	221.235	0.000	221.235
Description: AWCFT funds Project Maven, a rapid fielding AI program to augment and automate PED for FMV of UAVs, Medium Altitude, High Altitude, and WAMI ISR platforms in support of defeat-ISIS and NDS peer/near peer competitor strategy. Maven also brings AI to CEM, ACINT, OPIR and PAI exploitation. Maven uses artificial intelligence, deep learning, and computer vision algorithms to detect, classify, and track objects within FMV images (e.g., person, vehicle, and weapon) and other AI algorithms for CEM and text based projects. Maven algorithms increase the intelligence value of ISR, reduce the human burden of screening so analysts can multi-task increasing productivity, and seeds the generation of insight from GEOINT. Project Maven is a commercial technology initiative that inserts commercial AI into existing programs of records. Most military intelligence exploitation systems were designed pre-AI and require specialized integration to enable the insertion of algorithms into their software baseline. Project Maven is the pathfinder AI initiative for the DoD and is investing in critical architecture to support the rapid expansion of AI to other mission areas besides GEOINT. As Maven algorithms increase in capability, the algorithms will move to the edge (on the sensor platform).					
FY 2019 Plans:					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense								Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
N/A										
FY 2020 Base Plans: Project Maven uses rapid prototype sprints to field increasing amounts of automation to FMV ground exploitation stations for UAVs, Medium Altitude, High Altitude and WAMI ISR platforms and accelerate the development and deployment of AI capabilities across the Defense Intelligence Enterprise, including exploitation of CEM, ACINT,OPIR and PAI exploitation Maven will use artificial intelligence, deep learning, and computer vision algorithms to detect, classify, and track objects within FMV images (e.g., person, vehicle, and weapon) and other AI algorithms for CEM and text based projects. This initiative brings artificial intelligence, deep learning, and computer vision into the process of object detection, identification, and tracking at computer process speed versus human speed. Incorporating computer vision and algorithms will reduce the human burden and provide efficient and effective exploration of data. Project Maven develops algorithms focused on tactical UAV FMV Automatic Target Recognition (ATR) and an operational PED environment for platforms and ground stations. AW builds capabilities, integrate AI and ML to provide actionable intelligence and enhance military decision-making by providing algorithms for object detection, classification and user alerts.										
FY 2020 OCO Plans: N/A										
FY 2019 to FY 2020 Increase/Decrease Statement: In order to delineate funding designation and mission execution, Algorithmic Warfare Cross Functional Teams (Maven) was transferred from PE 0305245D8Z to PE0307588D8Z beginning in FY 2020. In addition, the department increased FY 2020 across all appropriations in order for the DoD to invest in critical AI architecture to support the rapid expansion of AI to other mission areas besides GEOINT. As Maven algorithms increase in capability, the algorithms will move to the edge (on the sensor platform).										
Accomplishments/Planned Programs Subtotals						0.000	0.000	221.235	0.000	221.235
C. Other Program Funding Summary (\$ in Millions)										
Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete Total Cost
• O&M PE0307588D8Z: Algorithmic Warfare Cross Functional Team (AWCFT)	0.000	0.000	20.825	0.000	20.825	5.000	5.000	5.000	5.000	Continuing Continuing

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense							Date: February 2019		
Appropriation/Budget Activity 0400 / 6				R-1 Program Element (Number/Name) PE 0307588D8Z / <i>Algorithmic Warfare Cross Functional Team (AWCFT)</i>			Project (Number/Name) 590 / <i>Algorithmic Warfare Cross Functional Team (AWCFT)</i>		

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

<u>Line Item</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020</u> <u>Base</u>	<u>FY 2020</u> <u>OCO</u>	<u>FY 2020</u> <u>Total</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• PROC PE0307588D8Z: <i>Algorithmic Warfare Cross Functional Team (AWCFT)</i>	0.000	0.000	8.206	0.000	8.206	0.000	0.000	0.000	0.000	Continuing	Continuing

Remarks

D. Acquisition Strategy

AWCFT's contracting strategy follows guidance outlined in the DoD 5000 series directives, Federal Acquisition Regulation (FAR), Defense Federal Acquisition Regulation (DFAR) and rapid prototyping policies and procedures. Management uses project management tools and meetings to ensure delivery of stated capabilities and performance criteria are achieved.

E. Performance Metrics

Performance Metrics are measured through internal management controls and external assessments. Performance metrics include, but are not limited to, time, money, realism, fidelity, and transition as defined below:

- Time – Enable the warfighter to take advantage of cutting edge technology to perform human burdened tasks at machine speed. This allows the warfighter to perform more cognizant tasks and process more information at rapid speed.
- Money – Enable the warfighter to reduce duplication of effort and to prepare and execute events at a more effective and efficient cost than current capabilities allow.
- Realism – Enable the warfighter to have a consolidated intelligence picture to increase the lethality by enabling faster and better decision making by the commander to execute operations in support of the National Defense Strategy.
- Fidelity – Ensure unity of efforts throughout the Defense Intelligence Enterprise.
- Transition – Establish a pipeline to allow Services to integrate Artificial Intelligence technology into programs of record to operationalize capabilities

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity					R-1 Program Element (Number/Name)							
0400: Research, Development, Test & Evaluation, Defense-Wide I BA 7: Operational Systems Development					PE 0607210D8Z I Industrial Base Analysis and Sustainment Support							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	61.296	16.464	48.765	10.051	0.000	10.051	10.129	10.176	10.360	10.482	Continuing	Continuing
819: Industrial Base Analysis and Sustainment	61.296	16.464	48.765	10.051	0.000	10.051	10.129	10.176	10.360	10.482	Continuing	Continuing

A. Mission Description and Budget Item Justification

Industrial Base Analysis and Sustainment (IBAS) was established in accordance with 10 USC Sec 2508 Industrial Base Fund direction to strengthen the force 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 goals within the 2018 National Defense Strategy for a strong, resilient, responsive and healthy US Industrial Base (IB) that improves the Departments force readiness posture. This program is uniquely positioned to improve the US Industrial Base's competitiveness and ability to respond to the Departments 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. 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 is fundamental to achieving a modern IB that integrates traditional and emerging sectors to be able to respond at will to National Security Requirements.

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) advancing and sustaining both traditional and emerging defense manufacturing sectors,
- 2) preserving critical and unique manufacturing and design skills,
- 3) supporting and expanding reliable sources, and
- 4) identifying and mitigating supply chain vulnerabilities

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 7: Operational Systems Development</i>	R-1 Program Element (Number/Name) PE 0607210D8Z I <i>Industrial Base Analysis and Sustainment Support</i>
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B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	10.882	10.376	10.428	0.000	10.428
Current President's Budget	16.464	48.765	10.051	0.000	10.051
Total Adjustments	5.582	38.389	-0.377	0.000	-0.377
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	6.000	38.500			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.397	-			
• FFRDC	-0.021	-0.111	-	-	-
• Realignment for Administration priorities for Biological and Chemical Threats Preparedness	-	-	-0.377	-	-0.377

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

Project: 819: *Industrial Base Analysis and Sustainment*

Congressional Add: *Program Increase*

	FY 2018	FY 2019
	6.000	38.500
Congressional Add Subtotals for Project: 819	6.000	38.500
Congressional Add Totals for all Projects	6.000	38.500

Change Summary Explanation

Congressional Adds for FY 2018 and FY 2019 are addressed in the R2a section on Congressional Adds

FY 2020 change is Realignment for Administration priorities for Biological and Chemical Threats Preparedness

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
819: Industrial Base Analysis and Sustainment	61.296	16.464	48.765	10.051	0.000	10.051	10.129	10.176	10.360	10.482	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Decrease from FY 2019 to FY 2020 reflects the FY 2019 four one-time appropriation enactment increases of \$38,500 as addressed in the R2a Congressional Add section

A. Mission Description and Budget Item Justification

IBAS mission is to strengthen the force posture and readiness of the U.S. Defense Manufacturing and Industrial Base to respond at will to national security needs.

The IBAS program has a multi-pronged approach to identify projects: 1) assessments of the national technology and industrial base by the OSD Acquisition & Sustainment (A&S), Office of Industrial Policy (INDPOL) as directed by 10 U.S. Code 2505, and 2) working directly in partnership with defense programs, and 3) working directly with industry. INDPOL collaborates with the services and agencies in performing assessments under the Title 10 USC Section 2505 program to identify elements of the industrial base critical to a healthy and resilient defense industrial base:

- 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
- 4) Education and manufacturing workforce skills

The continued corrosion on the industrial base is a direct and severe threat to National Security, especially with the reemergence of long-term, strategic competition of authoritarian peer nations.

FY 2020 and beyond investment strategies will also be informed by, 1) the findings of Executive Order (EO) 13806, "Assessing and Strengthening the Manufacturing and Defense Industrial Base and Supply Chain Resiliency of the United States," and 2) the Committee on Foreign Investment in the U.S. (CFIUS). The EO assessment identified nearly 300 risks across 16 sectors; concludes the current state and trajectory of the U.S. industrial base and our capacity to support readiness is in question; and requires significant changes including increased investment for the industrial base.

Findings from the nine traditional defense sectors and seven cross-cutting sectors will be used to inform both product specific investments as well as developing enterprise-wide initiatives to mitigate and capture domestic capabilities.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense			Date: February 2019				
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					
IBAS investments seek to ameliorate industrial base and manufacturing issues to strengthen the defense industrial base. All projects are evaluated for industrial base risks using fragility and criticality risk criteria, similar to the more familiar probability and consequence risk criteria. Fragility examines characteristics that make a specific capability likely to be disrupted. Criticality examines characteristics that make a specific capability difficult to replace if disrupted.							
IBAS currently focuses efforts and investments in four categories: Radars, Sensors, and Electronics Sectors; Materials Sector; Munitions and Missiles Sector; and Cross-cutting Supply Chain Vulnerabilities Mitigation.							
Cornerstone Other Transaction Agreement (OTA): Enhanced efficiency of IBAS program execution will be supported by a new non-Federal Acquisition Regulation (FAR) OTA procurement vehicle called Cornerstone, established February 2018 in partnership between ODASD (Industrial Policy) and the Army Edgewood Chemical Biological Center (ECBC). Cornerstone was specifically designed for industrial base investments to meet the Departments needs to improve readiness and sustainment through proactive engagement and investment within and across supply chains. Cornerstone provides the ability to access (18) different industry sectors under one agreement where all parties have agreed to one common management agreement and one intellectual property agreement, and it allows the Government to open or direct solicit tasks as legally appropriate against OTA statues. Cornerstone’s period of performance is “in perpetuity” with no overall ceiling, with task award ceilings. IBAS authorities coupled with Cornerstone enable the department to efficiently execute IBAS investments – positioning the industrial base to modernize at pace with our military.							
B. Accomplishments/Planned Programs (\$ in Millions)			FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Supply Chain Vulnerabilities Mitigation			2.718	1.715	3.954	0.000	3.954
Description: Efforts include supplier specific, sector specific, and enterprise-wide efforts. Supplier specific efforts support one or more programs and are critical path suppliers, sole or single source suppliers. Sector-Specific investments are aimed at addressing vulnerabilities across multiple-participants that share a common issue; and enterprise-wide are cross-cutting challenges requiring mitigation. Findings from the Executive Order 13806 assessment for both traditional defense sectors and cross-cutting sectors will inform this effort including supply chain issues for ships and subs, casting and forgings, workforce skills for the trades including welding and machining, and machine tools.							
FY 2019 Plans: FOCUS: Entrants into the technical skills lag both commercial and defense requirements. Lack of awareness and prestige of the career opportunities stifled potential candidates from entering. Surging defense production budgets concurrent with rising U.S. manufacturing are placing significant pressures on states and companies to increase entrants and accelerate development. Specialty defense skills such as those related to ship construction and precision optics are highly constrained. The focus in FY 2019 is to coalesce past and ongoing workforce development efforts for engineering and trade skills into a structured framework to elevate the prestige of and need for the technical skills; accelerate entrants into the technical skills, and comprehensively accelerate							

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense				Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
training for the technical skills. . This FY 2019 initiative shall coalesce prior projects, Manufacturing Skills Challenge and ELEV8 Supply Chain Resiliency, and expand into precision optics and additional shipyard trade skills, into an industrial base enterprise level. Specific Efforts: Manufacturing Skills Challenge (MSC). This effort was initiated in prior years, and continues into FY 2020. MSC project description is addressed below for FY 2020 Plans. FY 2020 Base Plans: The engineering and workforce development trade skills initiative will begin executing pilot projects for precision optics, large volume machine parts, and expand the manufacturing skills challenge. Manufacturing Skills Challenge (MSC): Similar to STEM efforts such as First Robotics, the MSC project seeks to close gaps in industrial capabilities, increase industrial base readiness, elevate the prestige of manufacturing, and identify future supply chain members by establishing a manufacturing skills challenge. This effort across multiple fiscal years starting in FY 2017 is a collaboration between OSD and the National Aeronautics and Space Administration (NASA) to define and address strategic manufacturing value chain vulnerabilities and technologies, and strengthen workforce skills. This effort includes competitions with "Support for a prize". The pilot effort will focus on welding workforce in the Southeast corridor including Mississippi, Louisiana, Alabama, and South Carolina where large ship, aerospace, and automotive growth have created workforce skills and supply chain challenges. Executive Order (EO) 13806 Findings in Supply Chain Vulnerabilities: Efforts will include mitigation of foreign dependency; critical path suppliers for production, surge, and sustainment; and workforce skills. FY 2020 OCO Plans: NA FY 2019 to FY 2020 Increase/Decrease Statement: Net increase of \$2.239 represents focused attention on DoD Supply Chain Vulnerabilities outlined above, requiring reprioritization and realignment of available resources from other sectors within this Program Element.						
Title: Radars, Sensors, and Electronics Sectors		2.354	2.329	3.650	0.000	3.650
Description: The enabling components and systems capabilities availability is limited with few domestic suppliers, presenting risks to system production and sustainment and directly impacting system procurement						

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense			Date: February 2019				
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
and maintenance costs. These limitations of technology can be overcome by identifying common industrial base challenges, development of sustainable modular and scalable architectures, supported by a strengthened and broadened domestic supplier base. Sector investments will improve production process efficiencies, explore modular and scalable technology, and upgrade outdated radar and sensor technology.							
FY 2019 Plans: Radar Affordability: Continuing an effort started in 2014 to collaborate and field cross reaching radar technologies, with an emphasis on driving down program costs and increasing operational tempo through common technology optimization and industry coordination. FY 2019 focuses on the development and execution of a supplier resiliency strategy that specifically focuses on key components of DoD radars in an open and modular architecture and then starts the execution of the proof-of-concept effort with the U.S. Navy's SPS-49 Technology Refresh Program.							
Directed Energy (DE)Supply Chain Assurance: Continuing an effort initiated in FY 2018, supply chain assessment coordination of critical technology investments that promote improvements in DE production technologies and applications involved in lasers and common electro optic technologies.							
Small Diameter Bomb Multispectral Zinc Sulfide (ZnS): Establish and qualify domestic source for multispectral Zinc Sulfide (ZnS) dome capability for critical munitions. Effort initiated in FY 2018 and scheduled for completion with FY 2019 resources.							
FY 2020 Base Plans: Radar Affordability, continuing an effort started in 2014 to collaborate and field cross reaching radar technologies, with an emphasis on driving down program costs through common technology optimization and industry coordination. FY 2020 focuses on creating detailed system engineering models within the open and modular architectures to enable the DoD to leverage small to medium size companies in defense and in adjacent industrial markets to improve overall DoD radar supplier resiliency.							
Fused Panoramic Night Vision Goggle (F-Pano) Declining research and development for critical subcomponents risks the ability to field next generation technologies. This project will exercise the design and production skills for next generation capabilities to maintain industrial base design capabilities and catalyze innovation. The							

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense			Date: February 2019			
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
design skills will develop a fused panoramic night vision goggle; power integration; and modular design and packaging. FY 2020 OCO Plans: NA FY 2019 to FY 2020 Increase/Decrease Statement: Increase of \$1.321 includes a \$1.000 decrease for completion of the Directed Energy and Small Diameter Bomb efforts in FY 2019; an increase of \$1.200 for the new start F-Pano Night Vision Goggle effort, and reallocation increase of \$.892 to focus on tentative completion of Radar Affordability efforts in FY 2020. This total increase represents reprioritization and realignment of available resources within this Program Element.						
Title: Materials Sector Description: This multi-year Materials Sector is focused on maturing technologies necessary for the construction of DoD ground, air, and space assets, to mitigate risks associated with the reliance on non-US materials and components. This sector is envisioned to address the technical risk associated with the dependence on materials from foreign non allied countries. The materials sector is currently focused on three general focus areas within the portfolio: 1) Boron Carbide, 2) Carbon Fiber and Carbon Nanotubes, and 3) Congressional Add efforts (described below in the Congressional Adds section). FY 2019 Plans: Boron Carbide (B4C) Initiative. B4C is a critical material across a wide range of DoD systems such as armor and rocket nozzles. Current sources are foreign and at risk. This IBAS initiative is a multi-year effort to: first develop a U.S. source, second to qualify the U.S. B4C material into a program of record (body armor), third to develop a second U.S. source to provide competition and surge capability, and forth to begin systematically qualifying both U.S. sources across multiple systems. Carbon Fiber and Carbon Nanotube Initiative: is a multi-project multi-year enterprise wide effort to ensure critical material to critical systems (space platforms and missiles). The IBAS program is assessing its FY 2018 investments into its Carbon Fiber Domestic Sourcing efforts for follow-on funding requirements. Carbon Fiber Poly-Acrylic-Nitrile (PAN) Alternative to Rayon Carbon Fiber: effort initiated in FY 2019 and continuing into FY 2020. Project description addressed below under FY 2020 Base Plans.		2.344	2.721	2.052	0.000	2.052

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense				Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Braided Carbon Fiber: Innovative emerging capability for a single layer quasi-isotropic carbon fiber fabric for improved production of composite structures, predominantly in aircraft and space platforms. FY 2020 Base Plans: Carbon Fiber Poly-Acrylic-Nitrile (PAN) Alternative to Rayon Carbon Fiber: This effort was initiated in FY 2019. DoD is dependent on a single foreign source of unique and proprietary rayon-based carbon fibers for critical materials requirements in DoD strategic and tactical strike missile systems, ballistic missile defense interceptors, military and civilian space launch systems, and other hypersonic defense systems. Current materials are either produced at a foreign sole source outside the United States or are no longer in production due to material obsolescence. These materials represent a high risk to key DoD defense system supply chains. The purpose of this project is to fund needed evaluation, demonstration, qualification and transition of potential substitute carbon fibers produced from domestically-produced commercial sources of poly-acrylic-nitrile (PAN)-based carbon fibers and therefore mitigate the supply risk of sole foreign and obsolete sources. FY 2020 OCO Plans: NA FY 2019 to FY 2020 Increase/Decrease Statement: Decrease of \$.669 reflects tentatively final FY 2020 investment in the two-year project phasing for the Carbon Fiber effort, pending identification and reallocation of resources for other Carbon Fiber requirements. This decrease represents reprioritization and realignment of available resources within this Program Element.						
Title: Munitions and Missiles Sector Description: With a multi-decade decline in missile program development and procurement, design and production capabilities for critical components within the missile sector industrial base are at risk. This has a significant impact on current and future missile programs, limiting the readiness and availability of superior technology to U.S. Warfighters. The missile sector sustainment will exercise the design and production skills of this critical industrial base by improving existing production processes, exploring advanced materials for higher performance, and upgrading outdated technology for missile components. FY 2019 Plans: Fuze initiative for Electronic Safe and Arm Device (ESAD), an effort continuing from prior years, to mitigate a supply chain loss caused by a reduction in non-DoD demand. Industrial Base (IB) design and production		3.048	3.500	0.395	0.000	0.395

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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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
workforce critical skills were needed to meet future requirements. Application of ESAD designs as common architecture to multiple missiles and munitions during this phase enables realization of the desired cost savings. FY 2020 Base Plans: FY 2019 efforts are complete, with no carry-over into FY 2020. No new efforts are currently programmed in this sector for FY 2020. Available resources have been realigned within this Program Element based on reprioritization of requirements. FY 2020 OCO Plans: NA FY 2019 to FY 2020 Increase/Decrease Statement: Decrease of \$3.105 reflects completion of FY 2019 efforts, with no significant carry-over into FY 2020, and no new efforts programmed in this sector for FY 2020. Munitions and Missiles Sector decrease represents reprioritization and realignment of available resources within this Program Element.						
Accomplishments/Planned Programs Subtotals		10.464	10.265	10.051	0.000	10.051
		FY 2018	FY 2019			
Congressional Add: Program Increase FY 2018 Accomplishments: Navy Ship & Industrial Base Sector Propulsion Foundry Improvement: This effort addresses a critical issue by maintaining a unique and vital manufacturing capability at the only U.S. commercial producer of critical propulsors. In 2014, the producer announced it was preparing to close its facility and relocate operations OCONUS. Investing in casting equipment allows the producer to develop additional skills, which should drive revenue and increase the foundry's utilization rate. Keeping the U.S. foundry operational is vital to maintaining and protecting domestic production of Navy submarine and surface ship propulsors. Electron Beam Welding (EBW): Alternative electron beam welding (EBW) processes are required to support critical path production timelines for large volume support structures. EBW enables significant cost, schedule, and quality benefits over traditional, domestically available arc welding technologies. Currently large volume EBW is only available at a foreign source. This effort seeks to establish a U.S. capability via a phased approach, which includes: welding process		6.000	38.500			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 7	R-1 Program Element (Number/Name) PE 0607210D8Z / <i>Industrial Base Analysis and Sustainment Support</i>	Project (Number/Name) 819 / <i>Industrial Base Analysis and Sustainment</i>	
		FY 2018	FY 2019
development, small scale prototype demonstrations, acquisition, installation and commissioning of large scale capable equipment, and full-scale prototype demonstration. EBW will enable the Navy to reduce the time required to produce large scale parts with significantly better repeatability, quality, and reliability, and at a lower cost.			
FY 2019 Plans: Program increase \$3.500: Microelectronics			
Expand manufacturing capability for Cold Rolled Aluminum \$10.000: optimize the manufacturing processes for aluminum armor alloys that are enabled by cold mill upgrades, which include dynamic shape rolling, non-contact shape measurement, automatic gauge, profile and flatness controls. The enhanced and upgraded cold mill will rapidly prototype aluminum armor manufacturing processes that not only optimize quality and throughput, but examine and mature processes to prototype mill products that enable more cost efficient downstream processing.			
Large Scale Classified Electron Beam Welding \$15.000: described above under Congressional Add FY 2018 Accomplishments.			
Risk reduction for tungsten defense products \$10.000: Defense applications for tungsten range widely: from consumables such as ammunition, bombs, and missiles to critical components in radar, communication equipment, tungsten carbide tooling inserts and ferrotungsten used in the production of super alloys in jet turbines. Several DoD programs have a supply chain vulnerability of either one domestic source or only foreign owned sources for tungsten. Dependence on a sole source results in higher costs to the DoD, inability to meet surge requirements, and creates a potential single point failure that could jeopardize the warfighter's access to an essential piece of material. This effort seeks to reduce risk and enhance the U.S. capability to produce tungsten through critical modernization investments in areas that support DoD, improve quality, efficiency and increase overall capacity.			
Congressional Adds Subtotals		6.000	38.500
C. Other Program Funding Summary (\$ in Millions)			
N/A			
Remarks			
NA			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 7	R-1 Program Element (Number/Name) PE 0607210D8Z / <i>Industrial Base Analysis and Sustainment Support</i>	Project (Number/Name) 819 / <i>Industrial Base Analysis and Sustainment</i>
D. Acquisition Strategy NA		
E. Performance Metrics Goal - Insert industrial base considerations consistently in program review: To make informed investment and production decisions To avoid reconstitution costs for capabilities that DoD will need again.		

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense												Date: February 2019			
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)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Munitions and Missiles Sector	C/Various	various : various	40.705	2.341		2.251		0.250		-		0.250	Continuing	Continuing	-
Supply Chain Vulnerabilities Mitigation	C/Various	various : various	4.212	2.086		1.103		2.507		-		2.507	Continuing	Continuing	-
Radars, Sensors, & Electronics Sector	C/Various	various : various	8.675	1.808		4.998		2.176		-		2.176	Continuing	Continuing	-
Critical Materials Sector	C/Various	various : various	2.800	1.800		21.750		1.300		-		1.300	Continuing	Continuing	-
Navy Ship & Industrial Base Sector	C/Various	various : various	-	6.000		15.000		-		-		-	Continuing	Continuing	-
Subtotal			56.392	14.035		45.102		6.233		-		6.233	Continuing	Continuing	N/A
Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Program Management - Army level support	Option/ BOA	Frontier Technology Inc : Rock Island, IL	1.550	1.144		0.000		0.000		-		0.000	0.000	2.694	-
Program Management - OSD level support	Option/ BOA	ByteCubed LLC : Alexandria VA	1.592	0.000		0.000		0.000		-		0.000	0.000	1.592	-
Program Management - Army	MIPR	RDECOM ECBC : Rock Island IL	1.762	0.285		0.975		0.993		-		0.993	Continuing	Continuing	-
Program Management - OSD support	C/T&M	Analytic Services Inc : Alexandria, VA	-	1.000		2.688		2.825		-		2.825	Continuing	Continuing	-
Subtotal			4.904	2.429		3.663		3.818		-		3.818	Continuing	Continuing	N/A
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			61.296	16.464		48.765		10.051		-		10.051	Continuing	Continuing	N/A
Remarks															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400 / 7	R-1 Program Element (Number/Name) PE 0607210D8Z / <i>Industrial Base Analysis and Sustainment Support</i>	Project (Number/Name) 819 / <i>Industrial Base Analysis and Sustainment</i>
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2017	2018	2019	2020	2021	2022	2023	2024
	Fuze Initiatives						
	ELEV8 Supply Chain Resiliency						
	Radar Affordability						
	Critical Energetic Materials						
	Carbon Fiber, Carbon Nanotube for Space						
	Securing the Industrial Base - Cyber						
	Boron Carbide – US Sourcing						
	Manufacturing Skills Challenge						
	Propulsion Foundry Improvement						
	Directed Energy Supply Chain Assurance						
		Small Diameter Bombs					
		Solid Rocket Motor					
		Unmanned Systems Affordability					
		Cold Rolled Aluminum					
		Microelectronics					
		Cornerstone OTA Tool					
		Ebeam Propulsion Initiative					
		Risk Reduction for Tungsten Defense Products					
		Carbon Fiber Poly-Acrylic-Nitrile (PAN) Alternative to Rayon Carbon Fiber					
		Next General Unmanned Aerial Systems					
		Fuzed Panoramic Night Vision Goggle					
		Executive Order 13806 Findings in Supply Chain Vulnerabilities					

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Office of the Secretary Of Defense			Date: February 2019
Appropriation/Budget Activity 0400 / 7	R-1 Program Element (Number/Name) PE 0607210D8Z / <i>Industrial Base Analysis and Sustainment Support</i>	Project (Number/Name) 819 / <i>Industrial Base Analysis and Sustainment</i>	

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
All Sectors				
Securing the Industrial Base - Cyber	4	2018	4	2022
Manufacturing Skills Challenge	3	2018	4	2022
ELEV8 Supply Chain Resiliency	2	2017	4	2022
Radar Affordability	2	2017	4	2022
Fuzed Panoramic Night Vision Goggle	2	2020	4	2022
Small Diameter Bombs	2	2019	4	2020
Boron Carbide - US Sourcing	2	2019	2	2021
Carbon Fiber, Carbon Nanotube for Space	4	2018	4	2019
Carbon Fiber Poly-Acrylic-Nitrile (PAN) Alternative to Rayon Carbon Fiber	2	2019	4	2022
Fuze Initiatives	2	2017	4	2020
Solid Rocket Motor	2	2019	4	2021
Critical Energetic Materials	3	2017	4	2020
Propulsion Foundry Improvement	4	2018	3	2022
Ebeam Propulsion Initiative	2	2019	2	2022
Unmanned Systems Affordability	2	2019	4	2022
Directed Energy Supply Chain Assurance	1	2019	4	2022
Braided Carbon Fiber	3	2019	2	2020
Cornerstone OTA Tool	2	2019	3	2020
Cold Rolled Aluminum	2	2019	4	2021
Risk Reduction for Tungsten Defense Products	3	2019	4	2022
Microelectronics	3	2019	4	2022

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Office of the Secretary Of Defense			Date: February 2019
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	

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Executive Order 13806 Findings in Supply Chain Vulnerabilities	4	2019	4	2024

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity					R-1 Program Element (Number/Name)							
0400: Research, Development, Test & Evaluation, Defense-Wide / BA 7: Operational Systems Development					PE 0607310D8Z / CWMD Systems: Operational Systems Development							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	10.588	6.945	5.902	12.734	-	12.734	13.209	12.320	12.552	12.679	Continuing	Continuing
242: Operational System Development	10.588	6.945	5.902	12.734	-	12.734	13.209	12.320	12.552	12.679	Continuing	Continuing

Note

Decrease from FY 2018 to FY2019 the result of reallocation of resources across the portfolio to better support the full RDT&E cycle and technology insertions. Increase from FY2019 to FY2020 the result of further reallocation of resources to gain efficiencies following the elimination of BA-6 / PE#0306310D8Z and combination of O&M projects CWMD Sustainment with Threat Reduction and Arms Control.

A. Mission Description and Budget Item Justification

The Countering Weapons of Mass Destruction (CWMD) Systems program provides funding for research, development, integration, and deployment of CWMD capabilities. Funding is allocated to a portfolio of projects and activities in response to Combatant Command, joint, and Military Service capability needs and research initiatives. The CWMD Systems program supports 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 program is organized to develop, enhance, mature and transition technologies across the RDT&E continuum, from Advanced Technology Development through Operational Systems Development, as well as limited sustainment in unique cases. A focus area is investment in CWMD-related technologies that require additional development to transition to fielded capabilities, in response to validated, prioritized requirements. This effort fills a seam in which capability gaps are not being addressed adequately or sufficiently to meet warfighter needs. The CWMD Systems program closes gaps identified by specialized military units and leverages prior S&T investments to continue development and fielding of operational systems to those units.

The program's legacy focus on CWMD situational awareness capabilities remains a significant component of the investment portfolio. U.S. Special Operations Command, which assumed CWMD mission responsibilities in January 2017 per the Unified Command Plan, is providing focus and guidance for development of CWMD situational awareness capabilities. The CWMD Systems program funds initiatives to close CWMD situational awareness gaps by leveraging mature technologies, modifying existing systems, and utilizing technology-enabled analytical cells to provide support to Combatant Commands and other joint and Service commands. These cells curate, synthesize, and contextualize CWMD information for end-users. This hybrid approach facilitates cross-organizational information sharing and collaboration, necessary for addressing the transregional character of WMD proliferation.

During FY 2018 and FY 2019 the CWMD Systems program utilized four Research, Development, Test & Evaluation (RDT&E) program elements (BA-3 / PE#0303310D8Z, BA-5 / PE#0305310D8Z, BA-6 / PE#0306310D8Z, and BA-7 / PE#0607310D8Z), as well as an Operations and Maintenance (O&M) "CWMD Sustainment" line (PE#0901388D8Z ORC-2531). Reallocation of resources beginning in FY 2020 will eliminate the BA-6 / PE#0306310D8Z program element and address O&M requirements with the "Threat Reduction and Arms Control" line (PE#0901388D8Z ORC-3501).

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide / BA 7: Operational Systems Development</i>	R-1 Program Element (Number/Name) PE 0607310D8Z / <i>CWMD Systems: Operational Systems Development</i>
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This Program Element (PE) funds upgrades and improvements to fielded systems or system components or enhancements to prototype technologies that are designed for the CWMD mission or can be repurposed to support it. Funding is used to integrate prototypes into existing systems or modify and enhance existing systems.

This appropriation funds travel to support the requirements of this program, and 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, development and test and evaluation efforts.

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	7.222	5.915	8.489	-	8.489
Current President's Budget	6.945	5.902	12.734	-	12.734
Total Adjustments	-0.277	-0.013	4.245	-	4.245
• Congressional General Reductions	0.000	-			
• Congressional Directed Reductions	0.000	-			
• Congressional Rescissions	-	-			
• Congressional Adds	0.000	-			
• Congressional Directed Transfers	0.000	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.263	-			
• FFRDC reduction	-0.014	-0.013			
• Reallocation from other CWMS Systems	-	-	4.722	-	4.722
PEs					
• Economic adjustment	-	-	-0.477	-	-0.477

Change Summary Explanation

Decrease from FY 2018 to FY2019 the result of reallocation of resources across the portfolio to better support the full RDT&E cycle and technology insertions. Increase from FY2019 to FY2020 the result of further reallocation of resources to gain efficiencies following the elimination of BA-6 / PE# 0306310D8Z and combination of O&M projects CWMD Sustainment with Threat Reduction and Arms Control.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 7					R-1 Program Element (Number/Name) PE 0607310D8Z / CWMD Systems: Operational Systems Development				Project (Number/Name) 242 / Operational System Development			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
242: Operational System Development	10.588	6.945	5.902	12.734	-	12.734	13.209	12.320	12.552	12.679	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Decrease from FY 2018 to FY2019 the result of reallocation of resources across the portfolio to better support the full RDT&E cycle and technology insertions. Increase from FY2019 to FY2020 the result of further reallocation of resources to gain efficiencies following the elimination of BA-6 / PE#0306310D8Z and combination of O&M projects CWMD Sustainment with Threat Reduction and Arms Control.

A. Mission Description and Budget Item Justification

The Countering Weapons of Mass Destruction (CWMD) Systems program provides funding for research, development, integration, and deployment of CWMD capabilities. Funding is allocated to a portfolio of projects and activities in response to Combatant Command, joint, and Military Service capability needs and research initiatives.

The CWMD Systems program is organized to develop, enhance, mature and transition technologies across the RDT&E continuum, from Advanced Technology Development through Operational Systems Development, as well as limited sustainment in unique cases. A focus area is investment in CWMD-related technologies that require additional development to transition to fielded capabilities, in response to validated, prioritized requirements. This effort fills a seam in which capability gaps are not being addressed adequately or sufficiently to meet warfighter needs. The CWMD Systems program closes gaps identified by specialized military units and leverages prior S&T investments to continue development and fielding of operational systems to those units.

The program's legacy focus on CWMD situational awareness capabilities remains a significant component of the investment portfolio. U.S. Special Operations Command, which assumed CWMD mission responsibilities in January 2017 per the Unified Command Plan, is providing focus and guidance for development of CWMD situational awareness capabilities. The CWMD Systems program funds initiatives to close CWMD situational awareness gaps by leveraging mature technologies, modifying existing systems, and utilizing technology-enabled analytical cells to provide support to Combatant Commands and other joint and Service commands. These cells curate, synthesize, and contextualize CWMD information for end-users. This hybrid approach facilitates cross-organizational information sharing and collaboration, necessary for addressing the transregional character of WMD proliferation.

During FY 2018 and FY 2019 the CWMD Systems program utilized four Research, Development, Test & Evaluation (RDT&E) program elements (BA-3 / PE#0303310D8Z, BA-5 / PE#0305310D8Z, BA-6 / PE#0306310D8Z, and BA-7 / PE#0607310D8Z), as well as an Operations and Maintenance (O&M) "CWMD Sustainment" line (PE#0901388D8Z ORC-2531). Reallocation of resources beginning in FY 2020 will eliminate the BA-6 / PE#0306310D8Z program element and address O&M requirements with the "Threat Reduction and Arms Control" line (PE#0901388D8Z ORC-3501).

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
Appropriation/Budget Activity 0400 / 7	R-1 Program Element (Number/Name) PE 0607310D8Z / CWMD Systems: Operational Systems Development	Project (Number/Name) 242 / Operational System Development		
This Program Element (PE) funds upgrades and improvements to fielded systems or system components or enhancements to prototype technologies that are designed for the CWMD mission or can be repurposed to support it. Funding is used to integrate prototypes into existing systems or modify and enhance existing systems.				
This appropriation funds travel to support the requirements of this program, and 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, development and test and evaluation efforts.				
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
Title: P*242: Operational Systems Development		6.945	5.902	12.734
Description: Funds upgrades and improvements to fielded systems or system components, or enhancements to prototype technologies, that are designed for the CWMD mission or can be repurposed to support it. Funding is used to integrate prototypes into existing systems or modify and enhance existing systems. Address the prioritized capability needs of existing information systems and other platforms to augment, upgrade and enhance core CWMD capabilities.				
FY 2019 Plans: • Upgrade and enhance technologies, applications, and information systems, focusing on systems in use by U.S. Special Operations Command and other Combatant Commands • Enhance or upgrade components of the DoD CWMD User-Defined Operational Picture (UDOP) in support of USSOCOM and other Combatant Commands • Enhance or upgrade systems or components for specialized military units requiring unique CWMD capabilities • Continue/complete development, integration, and/or modification of technologies, systems, and/or applications to meet CWMD capability needs of Combatant Commands and specialized military units, building upon projects initiated in FY2018 • Complete CWMD-related research and analysis conducted by faculty and military/civilian students at DoD academic institutions				
FY 2020 Plans: • Upgrade and enhance technologies, applications, and information systems, focusing on systems in use by U.S. Special Operations Command and other Combatant Commands • Enhance or upgrade systems or components for specialized military units requiring unique CWMD capabilities • Continue development, integration, and/or modification of technologies, systems, and/or applications to meet capability needs of Combatant Commands and specialized military units, building upon projects initiated in FY2019 • Complete CWMD-related research and analysis conducted by faculty and military/civilian students at DoD academic institutions				
FY 2019 to FY 2020 Increase/Decrease Statement: Increase from FY2019 to FY2020 the result of reallocation of resources to gain efficiencies following the elimination of BA-6 / PE#0306310D8Z and combination of O&M projects CWMD Sustainment with Threat Reduction and Arms Control.				
Accomplishments/Planned Programs Subtotals		6.945	5.902	12.734

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 7	R-1 Program Element (Number/Name) PE 0607310D8Z / CWMD Systems: <i>Operational Systems Development</i>	Project (Number/Name) 242 / <i>Operational System Development</i>
C. Other Program Funding Summary (\$ in Millions) N/A Remarks D. Acquisition Strategy Make improvements to fielded systems and identify how capabilities can be further improved through interoperability between fielded systems. E. Performance Metrics Success in this area is measured by compliance with various statutes and DoD directives that govern the conduct of the affairs within the Office of the Assistant Secretary of Defense for Nuclear, Chemical, and Biological Defense Programs (OASD/NCB). Maintain cost, schedule, and performance reporting, review, and adjudication. Maintain requirements traceability matrix.		

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense												Date: February 2019			
Appropriation/Budget Activity 0400 / 7						R-1 Program Element (Number/Name) PE 0607310D8Z / CWMD Systems: Operational Systems Development				Project (Number/Name) 242 / Operational System Development					
Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Upgrade & enhance SOF technologies, applications & information systems	MIPR	AFTAC : TBD	-	1.737	Jan 2018	1.479	Jan 2019	3.184		-		3.184	Continuing	Continuing	-
Upgrade & enhance DoD User-Defined Operational Picture (UDOP) in support of USSOCOM & other Combatant Commands	MIPR	USSOCOM : TBD	-	1.736	Feb 2018	1.477	Feb 2019	3.184		-		3.184	Continuing	Continuing	-
Enhance warfighter capability to collect WMD samples	Various	TBD : TBD	-	1.736	Mar 2018	1.479	Feb 2019	3.184		-		3.184	Continuing	Continuing	-
Enhance AFTAC capabilities to support nuclear treaty monitoring and nuclear event detection	MIPR	AFTAC : TBD	-	1.736	Jan 2018	1.467	Jan 2019	3.182		-		3.182	Continuing	Continuing	-
Upgrade fielded CWMD Systems and componenets	Various	Various : Various	10.588	-		-		-		-		-	Continuing	Continuing	-
Subtotal			10.588	6.945		5.902		12.734		-		12.734	Continuing	Continuing	N/A
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			10.588	6.945		5.902		12.734		-		12.734	Continuing	Continuing	N/A
Remarks															
Decrease from FY 2018 to FY2019 the result of reallocation of resources across the portfolio to better support the full RDT&E cycle and technology insertions. Increase from FY2019 to FY2020 the result of further reallocation of resources to gain efficiencies following the elimination of BA-6 / PE#0306310D8Z and combination of O&M projects CWMD Sustainment with Threat Reduction and Arms Control.															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense			Date: February 2019
Appropriation/Budget Activity 0400 / 7	R-1 Program Element (Number/Name) PE 0607310D8Z / CWMD Systems: Operational Systems Development		Project (Number/Name) 242 / Operational System Development

**CWMD Systems: Operational System Development
BA 7 / PE 0607310D8Z**

FY17				FY18				FY19				FY20				FY21				FY22				FY23			
Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Upgrade fielded CWMD Systems & components																											
				Upgrade & enhance SOF technologies, applications & information systems																							
				Upgrade & enhance DoD User-Defined Operational Picture (UDOP) in support of USSOCOM & others																							
				Enhance warfighter capability to collect WMD samples																							
				Enhance AFTAC capabilities to support nuclear treaty monitoring & nuclear event detection																							

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	38.455	19.074	17.899	67.631	-	67.631	56.355	55.655	10.857	10.857	Continuing	Continuing
140: Information Systems Security Program	38.455	19.074	17.899	67.631	-	67.631	56.355	55.655	10.857	10.857	Continuing	Continuing

Note

The FY2019 funding request was reduced by 2.133 million to account for the availability of prior year execution balances.

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 (CS&IA) Assurance Program to meet the requirements of 10 USC 2224 (Defense Information Assurance Program), 44 USC 3544, (Federal Information Security Management Act of 2002), OMB Circular A-130, and DoD Directives/Instructions 8500, 8510, 8520, 8530, and 8540. This program is funded under Budget Activity 7, Operational System Development, because it integrates technology and technical solutions to the Defense CS&IA Program.

ISSP RDT&E funds support the DoD CIO and its mission partners: on architecting, engineering, and technical matters for developing governance processes and structures; on evolving and enabling a more integrated and synchronized Joint Information Environment (JIE) to provide the means for more integrated information sharing and collaboration that also endeavors to close identified gaps across all mission areas with a shared network of core enterprise services; on the continued development of the U.S. Government's ability to prevent and defend against adversarial and/or commercial information and communications technology supply-chain attacks on its mission critical systems, networks, and devices; on improving oversight of the life-cycle management of cybersecurity risks; and on the integration of cybersecurity standards, methods, and procedures across the DoD for a more robust and resilient cybersecurity posture.

As specified below, the DoD CIO's investments in: the information assurance scholarship program; the integration of policies with the risk management framework to strengthen cybersecurity controls; cyber secure cloud computing; inclusion of cybersecurity considerations in hardware, software, and firmware early in the acquisition life-cycle; and analyses to develop artificial intelligence (AI) and machine learning to model network behavior, improve cyber threat detection, and transform information security – these investments all directly support the National Defense Strategy affirmed need to continue to modernize our capabilities in resilient cyber defenses, in artificial intelligence and machine learning, and the cultivation and development of workforce expertise in cybersecurity and information assurance to improve cyber capabilities across all military operations and support domains.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide / BA 7: Operational Systems Development</i>	R-1 Program Element (Number/Name) PE 0303140D8Z / <i>Information Systems Security Program</i>
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B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	9.415	7.940	11.631	-	11.631
Current President's Budget	19.074	17.899	67.631	-	67.631
Total Adjustments	9.659	9.959	56.000	-	56.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	10.000	10.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.323	-			
• FFRDC Reduction	-0.018	-0.041	-	-	-
• Classified Add	-	-	56.000	-	56.000

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

Project: 140: *Information Systems Security Program*

Congressional Add: *Information Assurance Scholarship Program*

	FY 2018	FY 2019
	10.000	10.000
Congressional Add Subtotals for Project: 140	10.000	10.000
Congressional Add Totals for all Projects	10.000	10.000

Change Summary Explanation

FY 2018: Congressional Add Information Assurance Scholarship Program 10.000 million, FFRDC reduction -0.018 million, SIBR/STTR Reduction -0.323 million.

FY 2019: FFRDC Reduction -0.041 million.

FY 2020: Classified Increase 56.000 Million.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
140: Information Systems Security Program	38.455	19.074	17.899	67.631	-	67.631	56.355	55.655	10.857	10.857	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The DoD CIO Information Systems Security Program (ISSP) provides for focused research, development, testing and integration of technology and technical solutions critical to the Defense Cybersecurity and Information (CS&IA) Assurance Program to meet the requirements of 10 USC 2224 (Defense Information Assurance Program), 44 USC 3544, (Federal Information Security Management Act of 2002), OMB Circular A-130, and DoD Directives/Instructions 8500, 8510, 8520, 8530, and 8540. This program is funded under Budget Activity 7, Operational System Development, because it integrates technology and technical solutions to the Defense CS&IA Program.

ISSP RDT&E funds support the DoD CIO and its mission partners: on architecting, engineering, and technical matters for developing governance processes and structures; on evolving and enabling a more integrated and synchronized Joint Information Environment (JIE) to provide the means for more integrated information sharing and collaboration that also endeavors to close identified gaps across all mission areas with a shared network of core enterprise services; on the continued development of the U.S. Government's ability to prevent and defend against adversarial and/or commercial information and communications technology supply-chain attacks on its mission critical systems, networks, and devices; on improving oversight of the life-cycle management of cybersecurity risks; and on the integration of cybersecurity standards, methods, and procedures across the DoD for a more robust and resilient cybersecurity posture.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
Title: Information Systems Security Program Plans and Accomplishments	9.074	7.899	67.631
FY 2019 Plans: <ul style="list-style-type: none"> • Support analyses on various aspects of cybersecurity for cloud-based computing for the DoD, analyses and refinement of 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 b addressing security requirements for systems transitioning to the commercial cloud. • Continued support for the DoD Information Assurance Scholarship Program (IASP), providing resourcing for scholarships for current students and recruitment of new students • Continue refinement and integration of policies with the risk management framework (RMF), supportive standards, guidance, efficiency in application of controls, 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 			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 7	R-1 Program Element (Number/Name) PE 0303140D8Z / <i>Information Systems Security Program</i>	Project (Number/Name) 140 / <i>Information Systems Security Program</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<p>(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.</p> <ul style="list-style-type: none"> • 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. • 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). • Continue to develop, publish, and refine DoD mobility strategy, processes for use of commercial Cloud providers, Cloud security guidance and procedures for use by potential commercial Cloud service providers, and continued oversight of policies and capabilities to support comprehensive cybersecurity capability for the Joint Information Environment (JIE). <p>FY 2020 Plans: \$56.000 million: Classified Add</p> <p>\$11.631 million:</p> <ul style="list-style-type: none"> • Support analyses that would develop artificial intelligence (AI) and machine learning to model network behavior and improve cyber threat detection, and AI capabilities that would enhance and potentially transform information security. 			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 7	R-1 Program Element (Number/Name) PE 0303140D8Z / <i>Information Systems Security Program</i>	Project (Number/Name) 140 / <i>Information Systems Security Program</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<ul style="list-style-type: none"> • 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 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 			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense								Date: February 2019					
Appropriation/Budget Activity 0400 / 7				R-1 Program Element (Number/Name) PE 0303140D8Z / <i>Information Systems Security Program</i>				Project (Number/Name) 140 / <i>Information Systems Security Program</i>					
B. Accomplishments/Planned Programs (\$ in Millions) (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. <i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> The FY2019 funding request was reduced to account for the availability of prior year execution balances. The funding was re-phased in FY2020 and FY2021. FY2020 \$56.000 classified add.								FY 2018		FY 2019		FY 2020	
Accomplishments/Planned Programs Subtotals								9.074		7.899		67.631	
								FY 2018		FY 2019			
<i>Congressional Add:</i> Information Assurance Scholarship Program								10.000		10.000			
<i>FY 2018 Accomplishments:</i> Information Assurance Scholarship Program													
<i>FY 2019 Plans:</i> Information Assurance Scholarship Program													
Congressional Adds Subtotals								10.000		10.000			
C. Other Program Funding Summary (\$ in Millions)													
Line Item		FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost	
• 0303140D8Z O&M DW: <i>Information System Security Program</i>		14.294	16.033	9.809	-	9.809	10.029	10.199	10.402	10.658	Continuing	Continuing	
Remarks													
D. Acquisition Strategy N/A													
E. Performance Metrics - Annual FISMA metrics - Evolving JIE cybersecurity metrics													

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense												Date: February 2019			
Appropriation/Budget Activity 0400 / 7						R-1 Program Element (Number/Name) PE 0303140D8Z / <i>Information Systems Security Program</i>						Project (Number/Name) 140 / <i>Information Systems Security Program</i>			
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Studies and Analysis	Option/ Various	Various : Various	1.756	0.911	Jul 2018	0.936	Jul 2019	1.962	Jul 2020	-		1.962	Continuing	Continuing	-
Technical Engineering Services	Option/ Various	Various : Various	15.970	7.187	Jul 2018	6.580	Jul 2019	56.000	Jul 2020	-		56.000	Continuing	Continuing	-
Services Support	Option/ Various	Various : Various	1.086	10.000	Jul 2018	10.000	Jul 2019	0.194	Jul 2020	-		0.194	Continuing	Continuing	-
Subtotal			18.812	18.098		17.516		58.156		-		58.156	Continuing	Continuing	N/A
Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Program Management Support	Option/ Various	Various : Various	1.173	0.508	Jul 2018	0.155	Jul 2019	0.394	Jul 2020	-		0.394	Continuing	Continuing	-
Engineering Support	Option/ Various	Various : Various	12.520	0.200	Jul 2018	0.100	Jul 2019	6.923	Jul 2020	-		6.923	Continuing	Continuing	-
Research & Development	Option/ Various	Various : Various	5.950	0.268	Jul 2018	0.128	Jul 2019	2.158	Jul 2020	-		2.158	Continuing	Continuing	-
Subtotal			19.643	0.976		0.383		9.475		-		9.475	Continuing	Continuing	N/A
Remarks NA															
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			38.455	19.074		17.899		67.631		-		67.631	Continuing	Continuing	N/A
Remarks NA															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity 0400 / 7	R-1 Program Element (Number/Name) PE 0303140D8Z / <i>Information Systems Security Program</i>	Project (Number/Name) 140 / <i>Information Systems Security Program</i>
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R4								
PE: 0303140D8Z/ Information Systems Security Program								

Funding supports focused research, development, testing and integration of technology and technical solutions critical to the Defense Information Assurance Program (10 USC 2224) through pilot programs and technology demonstration; investment in high leverage, near-term programs that offer immediate Information Assurance (IA) benefit.

	10/1/2018	10/1/2019	10/1/2020	10/1/2021	10/1/2022	10/1/2023	10/1/2024	10/1/2025
FY2018 Program Execution								
FY2019 Program Execution								
FY2020 Program Execution								
FY2021 Program Execution								
FY2022 Program Execution								
FY2023 Program Execution								
FY2024 Program Execution								

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Office of the Secretary Of Defense			Date: February 2019
Appropriation/Budget Activity 0400 / 7	R-1 Program Element (Number/Name) PE 0303140D8Z / <i>Information Systems Security Program</i>	Project (Number/Name) 140 / <i>Information Systems Security Program</i>	

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
*** SUBPROJECT TITLE ***				
FY 2019 Projected Execution	1	2019	2	2020
FY 2020 Projected Execution	1	2020	2	2021
FY 2021 Projected Execution	1	2021	2	2022
FY 2022 Projected Execution	1	2022	2	2023
FY 2023 Projected Execution	1	2023	2	2024

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 7: Operational Systems Development</i>	R-1 Program Element (Number/Name) PE 0305186D8Z I <i>Policy R&D Programs</i>
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	29.720	6.441	6.190	6.301	-	6.301	6.367	6.513	7.500	7.500	Continuing	Continuing
186: <i>Policy R&D Programs</i>	29.720	6.441	6.190	6.301	-	6.301	6.367	6.513	7.500	7.500	Continuing	Continuing

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. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	6.513	6.262	6.301	-	6.301
Current President's Budget	6.441	6.190	6.301	-	6.301
Total Adjustments	-0.072	-0.072	0.000	-	0.000
• Congressional General Reductions	-	-0.072			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.072	-			

Change Summary Explanation

FY 2020 adjustment made to support slighter higher projected costs.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
186: Policy R&D Programs	29.720	6.441	6.190	6.301	-	6.301	6.367	6.513	7.500	7.500	Continuing	Continuing
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 2018	FY 2019	FY 2020
Title: Future Security Challenges	2.111	2.604	2.643
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 2019 Plans: <ul style="list-style-type: none"> . Perform ongoing trend analysis and develop mitigation options for addressing program risks. • 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 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 2020 Plans: <ul style="list-style-type: none"> . Continue FY19 efforts with an emphasis on Defeating ISIS and Asian Maritime activities: . Perform ongoing trend analysis and develop mitigation options for addressing program risks. 			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
Appropriation/Budget Activity 0400 / 7	R-1 Program Element (Number/Name) PE 0305186D8Z / <i>Policy R&D Programs</i>	Project (Number/Name) 186 / <i>Policy R&D Programs</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<ul style="list-style-type: none"> • 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 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. <p>FY 2019 to FY 2020 Increase/Decrease Statement: The increase supports an added emphasis on developing methodologies and technologies to defeat our adversaries.</p>			
<p>Title: Long Term Competitions (LTC) Program</p> <p>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.</p> <p>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.</p> <p>FY 2019 Plans: Specific efforts are classified</p> <p>FY 2020 Plans: Specific efforts are classified</p> <p>FY 2019 to FY 2020 Increase/Decrease Statement:</p>		3.630	2.886
			2.958

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019	
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 2018	FY 2019
No change to planned costs.			
Title: Defense Planning Scenarios Activities Description: This program is classified. FY 2019 Plans: Specific efforts are classified. FY 2020 Plans: Specific efforts are classified. FY 2019 to FY 2020 Increase/Decrease Statement: No change to planned costs.		0.700	0.700
Accomplishments/Planned Programs Subtotals		6.441	6.190
C. Other Program Funding Summary (\$ in Millions)			
N/A			
Remarks			
D. Acquisition Strategy			
N/A			
E. Performance Metrics			
N/A			

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

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
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Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Policy R&D Programs	Various	National Defense Univ, FFRDCs : Various	29.720	6.441		6.190		6.301		-		6.301	Continuing	Continuing	-
Subtotal			29.720	6.441		6.190		6.301		-		6.301	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 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	29.720	6.441		6.190		6.301		-		6.301	Continuing	Continuing	N/A

Remarks
NA

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

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
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	FY19				FY20				FY21				FY22				FY23				FY24			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Policy R&D Programs																								
Develop Research Criteria																								
Technical Evaluation of Criteria																								
Product Development																								

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Office of the Secretary Of Defense		Date: February 2019
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

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>The Policy R&D Program provides analysis to overcome military challenges and for continued understanding of military structures, foreign cultures and ethnic issues</i>				
Policy R&D Program	1	2020	4	2024

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide / BA 7: Operational Systems Development</i>					R-1 Program Element (Number/Name) PE 0305199D8Z / <i>Net Centricity</i>							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	74.123	17.812	16.742	21.384	-	21.384	21.139	20.348	20.694	21.743	Continuing	Continuing
199: <i>GIG Evaluation Facilities (GIG-EF) and GIG Enterprise-Wide Systems Engineering Advisory Activities</i>	74.123	17.812	16.742	21.384	-	21.384	21.139	20.348	20.694	21.743	Continuing	Continuing

Note

The FY2019 funding request was reduced by 2.655 million to account for the availability of prior year execution balances.

A. Mission Description and Budget Item Justification

Funds will be used to provide technical analysis, systems engineering and capability management oversight of programs, projects, initiatives and activities to maximize the Department's return on investment in information technology resources and affect a comprehensive approach for assessing and procuring critical information systems from initial design, through development to capability delivery in support of improved systems performance and military operations. Emphasis is placed on the information transport, information assurance/cyber security, network and spectrum management, command and control (C2) applications, systems and services, information sharing capabilities, commercial mobile devices (CMD), applications and infrastructure, and enterprise services activities focused on the development, integration, testing and technical assessment of capabilities and applications in joint and coalition warfighter support environments. Resources support collaborative efforts to demonstrate the interoperability and performance requirements of command, control, communication, computing network, and Information Infrastructure (C4II) 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 C4II 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 C4II 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 initiating 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

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide / BA 7: Operational Systems Development</i>	R-1 Program Element (Number/Name) PE 0305199D8Z / <i>Net Centricity</i>
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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 that 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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	18.455	16.780	21.531	-	21.531
Current President's Budget	17.812	16.742	21.384	-	21.384
Total Adjustments	-0.643	-0.038	-0.147	-	-0.147
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.607	-			
• FFRDC Reduction	-0.036	-0.038	-	-	-
• Program Adjustment	-	-	-0.147	-	-0.147

Change Summary Explanation

FY 2018: FFRDC Reduction -0.036 million, SIBR/STTR Reduction -0.607 million.

FY 2019: FFRDC Reduction -0.038 million.

FY 2020: Program Adjustment -0.147million.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
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			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
199: GIG Evaluation Facilities (GIG-EF) and GIG Enterprise-Wide Systems Engineering Advisory Activities	74.123	17.812	16.742	21.384	-	21.384	21.139	20.348	20.694	21.743	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Funds will be used to provide technical analysis, systems engineering and capability management oversight of programs, projects, initiatives and activities to maximize the Department's return on investment in information technology resources and affect a comprehensive approach for assessing and procuring critical information systems from initial design, through development to capability delivery in support of improved systems performance and military operations. Emphasis is placed on the information transport, information assurance/cyber security, network and spectrum management, command and control (C2) applications, systems and services, information sharing capabilities, commercial mobile devices (CMD), applications and infrastructure, and enterprise services activities focused on the development, integration, testing and technical assessment of capabilities and applications in joint and coalition warfighter support environments. Resources support collaborative efforts to demonstrate the interoperability and performance requirements of command, control, communication, computing network, and Information Infrastructure (C4II) 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 C4II 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 C4II 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 initiating 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-

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
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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.				
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
Title: Net Centricity Plans and Accomplishments		17.812	16.742	21.384
FY 2019 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). – 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.				

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
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B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
<ul style="list-style-type: none"> – 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. – Continue analysis of requirements, capability gaps and integrated priority lists of all joint requirements for C4II 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 LTE technology for DoD tactical use. – 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 C4II policies, plans, studies, roadmaps, and capability assessments. 			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
<ul style="list-style-type: none">– 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.– 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.				

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019						
Appropriation/Budget Activity 0400 / 7	R-1 Program Element (Number/Name) PE 0305199D8Z / <i>Net Centricity</i>	Project (Number/Name) 199 / <i>GIG Evaluation Facilities (GIG-EF) and GIG Enterprise-Wide Systems Engineering Advisory Activities</i>						
B. Accomplishments/Planned Programs (\$ in Millions)								
<ul style="list-style-type: none"> – 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 post 2019. – 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. <p>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.</p> <p>FY 2020 Plans:</p> <ul style="list-style-type: none"> – 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). 		<table> <tr> <th>FY 2018</th><th>FY 2019</th><th>FY 2020</th></tr> <tr> <td></td><td></td><td></td></tr> </table>	FY 2018	FY 2019	FY 2020			
FY 2018	FY 2019	FY 2020						

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense			Date: February 2019		
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B. Accomplishments/Planned Programs (\$ in Millions)			FY 2018	FY 2019	FY 2020
<ul style="list-style-type: none"> – 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. – 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. 					

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019						
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B. Accomplishments/Planned Programs (\$ in Millions)								
<ul style="list-style-type: none"> – 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 C4II 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 LTE technology for DoD tactical use. – 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 C4II 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). 		<table> <tr> <th>FY 2018</th><th>FY 2019</th><th>FY 2020</th></tr> <tr> <td></td><td></td><td></td></tr> </table>	FY 2018	FY 2019	FY 2020			
FY 2018	FY 2019	FY 2020						

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<ul style="list-style-type: none"> – 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. – 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 post 2019. – Continue technical analysis and facilitate execution of the SATCOM Systems Engineering Group (SSEG). 			

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019
<ul style="list-style-type: none"> – 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. <p>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.</p> <p><i>FY 2019 to FY 2020 Increase/Decrease Statement:</i> The FY2019 funding request was reduced to account for the availability of prior year execution balances. The funding was re-phased in FY2020 and FY2021.</p>			
Accomplishments/Planned Programs Subtotals		17.812	16.742
C. Other Program Funding Summary (\$ in Millions)			
N/A			
Remarks			
D. Acquisition Strategy			
N/A			
E. Performance Metrics			
<ul style="list-style-type: none"> – PPBE related issue development and approval – Successful technical development and analysis of the CIO and DCIO C4IIC portfolio of programs and activities – Develop comprehensive risk assessment and mitigation approaches of the CIO and DCIO C4IIC portfolio of programs and activities 			

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense												Date: February 2019			
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Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Studies and Analysis	Various	Various : Various	4.118	7.924	Jul 2018	7.115	Jul 2019	6.130	Jul 2020	-		6.130	Continuing	Continuing	Continuing
Technical Engineering Services	Various	Various : Various	45.895	3.400	Jul 2018	1.414		1.000		-		1.000	Continuing	Continuing	Continuing
Subtotal			50.013	11.324		8.529		7.130		-		7.130	Continuing	Continuing	N/A
Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Program Management Support	Various	Various : Various	14.677	2.000	Jul 2018	2.000	Jul 2019	5.679	Jul 2020	-		5.679	Continuing	Continuing	Continuing
Program Support	FFRDC	Various : Various	1.541	0.051	Jul 2018	0.097	Jul 2019	0.098	Jul 2020	-		0.098	Continuing	Continuing	Continuing
Engineering Support	FFRDC	Various : Various	7.053	3.600	Jul 2018	3.825	Jul 2019	5.811	Jul 2020	-		5.811	Continuing	Continuing	Continuing
R&D Support	Various	Various : Various	0.839	0.837	Jul 2018	2.291	Jul 2019	2.666	Jul 2020	-		2.666	Continuing	Continuing	Continuing
Subtotal			24.110	6.488		8.213		14.254		-		14.254	Continuing	Continuing	N/A
Project Cost Totals			74.123	17.812		16.742		21.384		-		21.384	Continuing	Continuing	N/A
Remarks															

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense	Date: February 2019
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Appropriation/Budget Activity 0400 / 7	R-1 Program Element (Number/Name) PE 0305199D8Z / <i>Net Centricity</i>	Project (Number/Name) 199 / <i>GIG Evaluation Facilities (GIG-EF) and GIG Enterprise-Wide Systems Engineering Advisory Activities</i>
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R4								
PE 0305199D8Z/ Net Centricity								
SATCOM, JIE, NC3 and Related Engineering Analysis								
	10/1/2018	10/1/2019	10/1/2020	10/1/2021	10/1/2022	10/1/2023	10/1/2024	10/1/2025
FY2018 Program Execution								
FY2019 Program Execution								
FY2020 Program Execution								
FY2021 Program Execution								
FY2022 Program Execution								
FY2023 Program Execution								
FY2024 Program Execution								

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Office of the Secretary Of Defense			Date: February 2019
Appropriation/Budget Activity 0400 / 7	R-1 Program Element (Number/Name) PE 0305199D8Z / <i>Net Centricity</i>	Project (Number/Name) 199 / <i>GIG Evaluation Facilities (GIG-EF) and GIG Enterprise-Wide Systems Engineering Advisory Activities</i>	

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
*** SUBPROJECT TITLE ***				
FY 2019 Projected Execution	1	2019	2	2020
FY 2020 Projected Execution	1	2020	2	2021
FY 2021 Projected Execution	1	2021	2	2022
FY 2022 Projected Execution	1	2022	2	2023
FY 2023 Projected Execution	1	2023	2	2024

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

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
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COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	18.352	2.067	1.137	2.221	-	2.221	2.273	2.375	2.374	2.374	Continuing	Continuing
387: Homeland Defense Technology Transfer Program	18.352	2.067	1.137	2.221	-	2.221	2.273	2.375	2.374	2.374	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In conjunction with Congressionally directed (Sec. 1401, P.L. 107-314) Homeland Defense Technology Transfer program, ensures a successful and balanced transfer of dual-use technology equipment and information to first responders without impeding military readiness. Accelerates dual-use tech transfer to first responders, increases effectiveness of equipment transfers to first responders, and transfers technology through a transitional effort that has dual utility to improve homeland security and enhance public safety without degrading military readiness. Meets the Congressional intent of Sec 1401, FY 2003 National Defense Authorization Act (P.L. 107-314).

A. Mission Description and Budget Item Justification

Continues Congressionally directed (Sec. 1401, P.L. 107-314) Technology Transfer Program to consolidate and coordinate various military endeavors that pass technology and equipment to first responders. Works with a variety of DoD activities, interagency partners, and first responder organizations to ensure that dual-use military technology is expedited into the commercial sector for use by law enforcement, fire, and emergency medical service personnel. Works with the Military Departments and Defense Logistics Agency to ensure that appropriate excess military equipment is made available to the first responder community on an expedited basis. Fulfills Congressional intent to help improve public safety and enhance public security.

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	2.071	2.198	2.221	-	2.221
Current President's Budget	2.067	1.137	2.221	-	2.221
Total Adjustments	-0.004	-1.061	0.000	-	0.000
• Congressional General Reductions	-	-0.061			
• Congressional Directed Reductions	-	-1.000			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.004	-			

Change Summary Explanation

FY 2020 change reflects increase in support costs.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019		
Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 7: Operational Systems Development</i>		R-1 Program Element (Number/Name) PE 0305387D8Z I <i>Homeland Defense Technology Transfer Program</i>		
C. Accomplishments/Planned Programs (\$ in Millions)		FY 2018	FY 2019	FY 2020
Title: Homeland Defense Technology Transfer Program Description: Provided outreach through coordination and cooperation with inter-agency partners to provide dual-use technology and equipment to first responders. Ensured DoD components conducted Technology Transfer programs that are appropriate for the respective component. Provided information to stakeholders on equipment and technology use and availability. FY 2019 Plans: - Continue to implement efficiencies. - 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 2020 Plans: - 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 2019 to FY 2020 Increase/Decrease Statement: FY 2020 adjustment made to support slighter higher projected costs.		2.067	1.137	2.221
Accomplishments/Planned Programs Subtotals		2.067	1.137	2.221
D. Other Program Funding Summary (\$ in Millions) N/A				
Remarks				
E. Acquisition Strategy N/A				
F. Performance Metrics As stated.				

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense												Date: February 2019			
Appropriation/Budget Activity 0400 / 7						R-1 Program Element (Number/Name) PE 0305387D8Z / <i>Homeland Defense Technology Transfer Program</i>				Project (Number/Name) 387 / <i>Homeland Defense Technology Transfer Program</i>					

Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Homeland Defense Transfer of Dual-use Technology Equipment	MIPR	Navy Commands : SPAWAR, NSWC, ONR	18.352	2.067		1.137		2.221		-		2.221		Continuing	Continuing	-
Subtotal			18.352	2.067		1.137		2.221		-		2.221		Continuing	Continuing	N/A

Remarks N/A																
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			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			18.352	2.067		1.137		2.221		-		2.221	Continuing	Continuing	N/A

Remarks N/A																
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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense			Date: February 2019
Appropriation/Budget Activity 0400 / 7	R-1 Program Element (Number/Name) PE 0305387D8Z / <i>Homeland Defense Technology Transfer Program</i>	Project (Number/Name) 387 / <i>Homeland Defense Technology Transfer Program</i>	

	FY19				FY20				FY21				FY22				FY23				FY24			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Homeland Defense Transfer of Dual-use Technology Equipment																								
Develop Prototype Equipment																								
Technical Evaluation																								
Operational Field Evaluations																								

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Office of the Secretary Of Defense		Date: February 2019
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

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Technology Transfer				
Homeland Defense Transfer of Dual-use Technology Equipment	1	2019	4	2024

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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 7: Operational Systems Development</i>					R-1 Program Element (Number/Name) PE 0307577D8Z I <i>Intelligence Mission Data (IMD)</i>							
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	13.485	13.086	6.889	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	33.460
715: <i>Intelligence Mission Data</i>	13.485	13.086	6.889	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	33.460

A. Mission Description and Budget Item Justification

IMD project supports the Department's governance process for balancing IMD supply and demand and addressing how to modernize IMD generation. In order to support weapons systems with intelligence data, we need to improve the modeling, simulation and assessment process for weapon systems prior to material solutions to better understand investment needs for both platforms and intelligence data. IMD is all source intelligence derived data necessary to do the following for weapon systems: to identify and counter constantly improving threat weapons and radar systems; optimize sensor design and validate sensor functionality; and support system test, evaluation and deployment. Modern weapon systems are reliant upon increasingly voluminous and precise IMD to meet performance requirements. This demand signal for mission support data is increasing due to requirements for both analyst-evaluated, precise data and machine-processed data to be used by weapons and control systems with increasing autonomy. This increasing requirement is highlighting the need to have a big data/data autonomy environment to support advanced weapon systems. In order for the community to meet modern weapons system requirements, there needs to be a measured shift with balance and attention paid to legacy and new capability needs. There are unacceptable gaps, compounded by non-assessed program office needs and requirements that may not be obtainable; therefore, balancing supply and demand is urgently needed.

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	13.111	6.889	7.002	-	7.002
Current President's Budget	13.086	6.889	0.000	-	0.000
Total Adjustments	-0.025	0.000	-7.002	-	-7.002
• Congressional General Reductions	-0.025	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Departmental Adjustment	-	-	-7.002	-	-7.002

Change Summary Explanation

Transfers funding from the Office of Under Secretary of Defense (Intelligence) to the Military Departments and Defense Intelligence Agency for direct execution and responsibilities of the Intelligence Mission Data Intelligence Support to Acquisitions capabilities.

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense										Date: February 2019		
Appropriation/Budget Activity 0400 / 7					R-1 Program Element (Number/Name) PE 0307577D8Z / Intelligence Mission Data (IMD)				Project (Number/Name) 715 / Intelligence Mission Data			
COST (\$ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
715: Intelligence Mission Data	13.485	13.086	6.889	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	33.460
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

IMD project supports the Department's governance process for balancing IMD supply and demand and addressing how to modernize IMD generation. In order to support weapons systems with intelligence data we need to improve the modeling, simulation and assessment process for weapon systems prior to material solutions to better understand investment needs for both platforms and intelligence data. IMD is all source intelligence derived data necessary to do the following for weapon systems: to identify and counter constantly improving threat weapons and radar systems; optimize sensor design and validate sensor functionality; and support system test, evaluation and deployment. Modern weapon systems are reliant upon increasingly voluminous and precise IMD to meet performance requirements. This demand signal for mission support data is increasing due to requirements for both analyst-evaluated, precise data and machine-processed data to be used by weapons and control systems with increasing autonomy. This increasing requirement is highlighting the need to have a big data/data autonomy environment to support advanced weapon systems. In order for the community to meet modern weapons system requirements, there needs to be a measured shift with balance and attention paid to legacy and new capability needs. There are unacceptable gaps, compounded by non-assessed program office needs and requirements that may not be obtainable; therefore, balancing supply and demand is urgently needed.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2018	FY 2019	FY 2020
Title: Intelligence Mission Data	13.086	6.889	0.000
Description: The IMD project supports the Department's governance process for balancing IMD supply and demand and addressing how to modernize IMD generation. Modern weapon systems are reliant upon increasingly voluminous and precise IMD to meet performance requirements, causing IMD shortfalls. The Department resolved to correct IMD problems by chartering a temporary Acquisition, Intelligence and Requirements Task Force (AIRTF). The AIRTF instilled and enforced discipline, bridging long-standing policy, cultural and financial divides among these three communities, and built innovative approaches to solutions.			
FY 2019 Plans: Develop efforts with the Air Force and Navy Joint Simulation Environments to determine IMD sufficiency, conducting experiments that improve IMD prioritization and standardization across the consumers, prototype and develop new systems automation which will better support 5th Gen Weapon systems' determination of requirements priority/criticality. Initiate addition of ground combat systems into the environments.			
Complete the development phase of the Acquisition, Intelligence and Requirements Visualization of Enterprise Workflows (AIRVIEW) dashboard tool that enables data-driven resource decision making at a Departmental level. The tool captures and			

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense							Date: February 2019																										
Appropriation/Budget Activity 0400 / 7				R-1 Program Element (Number/Name) PE 0307577D8Z / <i>Intelligence Mission Data (IMD)</i>			Project (Number/Name) 715 / <i>Intelligence Mission Data</i>																										
B. Accomplishments/Planned Programs (\$ in Millions) tracks extensive intelligence data requirements for combat systems in acquisition and operations, and the Defense Intelligence Enterprise production response to those requirements, along with valuable business analytics. Complete the prototyping of enhancements to intelligence mission data enterprise databases (to include consumer elements) for the sake of enhancing and speeding data and information sharing, shrinking response times to adversary changes from months/years to days/weeks. Complete the development of a prototype that accelerates accumulation of raw intelligence data about modern complex emitters that is a precursor to Electronic Warfare intelligence data. The data is processed into a form that is more rapidly consumable and leads to a shorter response time from detection of new operating modes by adversary emitters to reprogramming centers' creation of the updated mission data files for friendly aircraft that will enhance their survivability and lethality. Complete efforts related to evaluating and improving the availability of an intelligence workforce that provides the Department with high quality support to acquisition programs. Institute a first-ever acquisition-intelligence training course at Defense Acquisition University, and articulate a career occupation program path for professionals with suitable competencies. FY 2020 Plans: N/A FY 2019 to FY 2020 Increase/Decrease Statement: Transfers funding from the Office of the Under Secretary of Defense (Intelligence) to the Military Departments and Defense Intelligence Agency for direct execution and responsibilities of the Intelligence Mission Data Intelligence Support to Acquisition capabilities.							FY 2018	FY 2019	FY 2020																								
Accomplishments/Planned Programs Subtotals							13.086	6.889	0.000																								
C. Other Program Funding Summary (\$ in Millions) <table border="1" style="width:100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th style="text-align: left;"><u>Line Item</u></th> <th><u>FY 2018</u></th> <th><u>FY 2019</u></th> <th><u>FY 2020</u> <u>Base</u></th> <th><u>FY 2020</u> <u>OCO</u></th> <th><u>FY 2020</u> <u>Total</u></th> <th><u>FY 2021</u></th> <th><u>FY 2022</u></th> <th><u>FY 2023</u></th> <th><u>FY 2024</u></th> <th><u>Cost To</u> <u>Complete</u></th> <th><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>• 0307577D8Z: <i>Intelligence Mission Data</i></td> <td align="center">0.853</td> <td align="center">5.152</td> <td align="center">1.992</td> <td align="center">-</td> <td align="center">1.992</td> <td align="center">2.535</td> <td align="center">2.873</td> <td align="center">2.901</td> <td align="center">2.928</td> <td align="center">Continuing</td> <td align="center">Continuing</td> </tr> </tbody> </table>										<u>Line Item</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020</u> <u>Base</u>	<u>FY 2020</u> <u>OCO</u>	<u>FY 2020</u> <u>Total</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>	• 0307577D8Z: <i>Intelligence Mission Data</i>	0.853	5.152	1.992	-	1.992	2.535	2.873	2.901	2.928	Continuing	Continuing
<u>Line Item</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020</u> <u>Base</u>	<u>FY 2020</u> <u>OCO</u>	<u>FY 2020</u> <u>Total</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>																						
• 0307577D8Z: <i>Intelligence Mission Data</i>	0.853	5.152	1.992	-	1.992	2.535	2.873	2.901	2.928	Continuing	Continuing																						
Remarks																																	
D. Acquisition Strategy The acquisition, management, and contracting strategy involves the following:																																	

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Exhibit R-2A, RDT&E Project Justification: PB 2020 Office of the Secretary Of Defense		Date: February 2019
Appropriation/Budget Activity 0400 / 7	R-1 Program Element (Number/Name) PE 0307577D8Z / Intelligence Mission Data (IMD)	Project (Number/Name) 715 / Intelligence Mission Data
<ul style="list-style-type: none">• Adhere to guidance outlined in the DoD 5000, Directive 7, Federal Acquisition Regulations (FAR), and FAR Supplement Policies and Procedures.• Acquire and sustain IMD 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.• Support advanced weapons programs need for intelligence at the earliest point in the acquisition of the program. <p>E. Performance Metrics</p> <p>Performance metrics are used to assess the progress toward integrating intelligence mission data into the acquisition cycle. The following metrics focus on the return on investment of RDTE and O&M activities and assess the degree to meeting mission goals:</p> <ul style="list-style-type: none">• Measure percent of funds that are used to improve advanced weapons platforms intelligence integration. Goal is 100%.• Measure percent of identified advanced weapons systems platforms that have a minimum baseline for IMD requirements and production. Goal is 100%.		

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity 0400 / 7	R-1 Program Element (Number/Name) PE 0307577D8Z / <i>Intelligence Mission Data (IMD)</i>	Project (Number/Name) 715 / <i>Intelligence Mission Data</i>
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Product Development (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Cost Capability analysis (CCA) with Force-on-Force Campaign Analysis (FCA)	Various	Various : Various	3.517	0.364	Nov 2017	1.166		-		-		-	0.000	5.047	5.047
Subcategory: Joint Simulation Environment (JSE) IMD Quality Program	C/ FFPLOE	Navy (NAWCAD); Air Force (SIMAF) : Pax River, MD; WPAFB, OH	1.410	2.065	Mar 2018	-		-		-		-	0.000	3.475	3.475
Enterprise-wide Source Data Access	Various	Various : Various	1.335	0.089	Dec 2018	1.143		-		-		-	0.000	2.567	2.567
Subcategory: IMD Technology Projects Licensing / Prototyping	C/FFP	ARMY RESEARCH LAB : Adelphi, MD	1.138	-		0.570		-		-		-	0.000	1.708	1.708
Intelligence Mission Data (IMD) Automation	Various	Various : Various	0.909	0.859	Mar 2018	-		-		-		-	0.000	1.768	1.768
Subcategory: IMD Emitter Engineering Model Automated Workflow	C/TBD	ARMY RESEARCH LAB : Adelphi, MD	-	4.000	Jul 2018	2.000		-		-		-	0.000	6.000	6.000
Subcategory: IMD Intercept TLM Algorithm Generation Support	C/TBD	GSA/FAS Region 5 : Fairborn, OH	2.035	-		-		-		-		-	0.000	2.035	2.035
Subcategory: EIM for IMD to the Cockpit	C/CPAF	NSA/B : Fort Meade MD	1.136	-		-		-		-		-	0.000	1.136	1.136
Subtotal			11.480	7.377		4.879		-		-		-	0.000	23.736	N/A

Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Cost Capability Analysis (CCA) w/ Force-on-Force Campaign Analysis (FCA)	Various	Various : Various	-	0.509	Sep 2018	-		-		-		-	0.000	0.509	0.509
Other	Various	Various : Various	-	0.119	Dec 2018	0.480		-		-		-	0.000	0.599	0.599

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense												Date: February 2019			
Appropriation/Budget Activity 0400 / 7						R-1 Program Element (Number/Name) PE 0307577D8Z / Intelligence Mission Data (IMD)				Project (Number/Name) 715 / Intelligence Mission Data					
Support (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Subcategory: AIRVIEW	SS/FFP	WHS/AD : Arlington, VA	-	2.242	May 2018	0.800	Nov 2018	-		-		-	0.000	3.042	3.042
Subtotal			-	2.870		1.280		-		-		-	0.000	4.150	N/A
Test and Evaluation (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Cost Capability analysis (CCA) with Force-on-Force Campaign Analysis (FCA)	SS/ Various	Various : Various	-	-		0.330		-		-		-	0.000	0.330	0.330
Subcategory: Fusion Test Bed Red Model Support	C/BPA	GSA - Great Lakes : Fairborn, OH	1.307	-		-		-		-		-	0.000	1.307	1.307
Subtotal			1.307	-		0.330		-		-		-	0.000	1.637	N/A
Management Services (\$ in Millions)				FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 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
Cost Capability Analysis with Force-on-Force Campaign Analysis	SS/CR	AFLCMC/AZS : Hanscom AFB, MA	0.306	1.429	May 2018	0.400	Oct 2018	-		-		-	0.000	2.135	2.135
Enterprise-wide Source Data Access	SS/CR	US Army CECOM : APG, MD	-	0.310	Jan 2018	-		-		-		-	0.000	0.310	0.310
Other	Various	Various : Various	0.392	1.100	May 2018	-		-		-		-	0.000	1.492	1.492
Subtotal			0.698	2.839		0.400		-		-		-	0.000	3.937	N/A
			Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			13.485	13.086		6.889		-		-		-	0.000	33.460	N/A

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Office of the Secretary Of Defense							Date: February 2019			
Appropriation/Budget Activity 0400 / 7				R-1 Program Element (Number/Name) PE 0307577D8Z / Intelligence Mission Data (IMD)			Project (Number/Name) 715 / Intelligence Mission Data			
	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract	
Remarks										

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense			Date: February 2019
Appropriation/Budget Activity 0400 / 7	R-1 Program Element (Number/Name) PE 0307577D8Z / <i>Intelligence Mission Data (IMD)</i>	Project (Number/Name) 715 / <i>Intelligence Mission Data</i>	

	FY 2011				FY 2012				FY 2013				FY 2014				FY 2015				FY 2016				FY 2017			
	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
<i>Intelligence Mission Data (IMD) Automation</i>																												
Concept/Architecture Analysis																												
EWIR IMD Automation Prototyping																												
End-to-End Data Flow Demonstrations																												
<i>Cost Capability Analysis (CCA) with Force-on-Force Campaign Analysis (FCA)</i>																												
Pilot Single-Platform and Multi-Platform Concepts																												
Execute IMD Sufficiency Analysis for Single-platform Environment																												
Develop Additional Models and Scenarios in the FCA Environment																												
Execute IMD Sufficiency Analysis for FCA																												
<i>Enterprise-wide Source Data Access</i>																												
Electronic Warfare Database Accessibility Enhancement Pilot Project																												
IMD Databases Content Management (CM) Application Programming Interfaces (APIs) Pilot																												
<i>Other (all funding FY17 or FY18)</i>																												
Acquisition Intelligence Workforce Training Course Development																												
Acquisition Intelligence Manpower Analysis/Assessment																												
Develop Dashboard for Intelligence Data Requirements and Production Planning																												

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Exhibit R-4, RDT&E Schedule Profile: PB 2020 Office of the Secretary Of Defense			Date: February 2019
Appropriation/Budget Activity 0400 / 7	R-1 Program Element (Number/Name) PE 0307577D8Z / <i>Intelligence Mission Data (IMD)</i>	Project (Number/Name) 715 / <i>Intelligence Mission Data</i>	

	FY 2018				FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024			
	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
Intelligence Mission Data (IMD) Automation																												
Concept/Architecture Analysis																												
EWIR IMD Automation Prototyping																												
End-to-End Data Flow Demonstrations																												
Cost Capability Analysis (CCA) with Force-on-Force Campaign Analysis (FCA)																												
Pilot Single-Platform and Multi-Platform Concepts																												
Execute IMD Sufficiency Analysis for Single-platform Environment																												
Develop Additional Models and Scenarios in the FCA Environment																												
Execute IMD Sufficiency Analysis for FCA																												
Enterprise-wide Source Data Access																												
Electronic Warfare Database Accessibility Enhancement Pilot Project																												
IMD Databases Content Management (CM) Application Programming Interfaces (APIs) Pilot																												
Other (all funding FY17 or FY18)																												
Acquisition Intelligence Workforce Training Course Development																												
Acquisition Intelligence Manpower Analysis/Assessment																												
Develop Dashboard for Intelligence Data Requirements and Production Planning																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2020 Office of the Secretary Of Defense			Date: February 2019
Appropriation/Budget Activity 0400 / 7	R-1 Program Element (Number/Name) PE 0307577D8Z / <i>Intelligence Mission Data (IMD)</i>	Project (Number/Name) 715 / <i>Intelligence Mission Data</i>	

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>Intelligence Mission Data (IMD) Automation</i>				
Concept/Architecture Analysis	4	2017	4	2018
EWIR IMD Automation Prototyping	4	2017	3	2020
End-to-End Data Flow Demonstrations	2	2019	4	2020
<i>Cost Capability Analysis (CCA) with Force-on-Force Campaign Analysis (FCA)</i>				
Pilot Single-Platform and Multi-Platform Concepts	4	2017	3	2019
Execute IMD Sufficiency Analysis for Single-platform Environment	2	2019	3	2019
Develop Additional Models and Scenarios in the FCA Environment	3	2018	2	2020
Execute IMD Sufficiency Analysis for FCA	2	2019	2	2020
<i>Enterprise-wide Source Data Access</i>				
Electronic Warfare Database Accessibility Enhancement Pilot Project	3	2017	3	2018
IMD Databases Content Management (CM) Application Programming Interfaces (APIs) Pilot	2	2018	1	2021
<i>Other (all funding FY17 or FY18)</i>				
Acquisition Intelligence Workforce Training Course Development	2	2018	2	2019
Acquisition Intelligence Manpower Analysis/Assessment	2	2018	4	2018
Develop Dashboard for Intelligence Data Requirements and Production Planning	1	2018	1	2020