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

February 2020



Operational Test and Evaluation, Defense

Defense-Wide Justification Book Volume 5 of 5

Operational Test and Evaluation, Defense

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Operational Test and Evaluation, Defense • Budget Estimates FY 2021 • RDT&E Program

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

10 Feb 2020

Appropriation -----	FY 2019 (Base + OCO)	FY 2020 Base Enacted	FY 2020 Emergency	FY 2020 OCO Enacted	FY 2020 Total Enacted (Base+Emerg+ OCO)
-----	-----	-----	-----	-----	-----
Operational Test & Eval, Defense	377,001	227,700			227,700
Total Research, Development, Test & Evaluation	377,001	227,700			227,700

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

10 Feb 2020

Appropriation	FY 2021 Base	FY 2021 OCO for Base Requirements	FY 2021 OCO for Direct War and Enduring Costs	FY 2021 Total OCO	FY 2021 Total (Base + OCO)
-----	-----	-----	-----	-----	-----
Operational Test & Eval, Defense	210,090				210,090
Total Research, Development, Test & Evaluation	210,090				210,090

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

10 Feb 2020

	FY 2019 (Base + OCO)	FY 2020 Base Enacted	FY 2020 Emergency	FY 2020 OCO Enacted	FY 2020 Total Enacted (Base+Emerg+ OCO)
Summary Recap of Budget Activities -----					
Management Support	377,001	227,700			227,700
Total Research, Development, Test & Evaluation	377,001	227,700			227,700
Summary Recap of FYDP Programs -----					
Research and Development	377,001	227,700			227,700
Total Research, Development, Test & Evaluation	377,001	227,700			227,700

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

10 Feb 2020

	FY 2021 Base	FY 2021 OCO for Base Requirements	FY 2021 OCO for Direct War and Enduring Costs	FY 2021 Total OCO	FY 2021 Total (Base + OCO)
Summary Recap of Budget Activities -----					
Management Support	210,090				210,090
Total Research, Development, Test & Evaluation	210,090				210,090
Summary Recap of FYDP Programs -----					
Research and Development	210,090				210,090
Total Research, Development, Test & Evaluation	210,090				210,090

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

10 Feb 2020

	FY 2019 (Base + OCO)	FY 2020 Base Enacted	FY 2020 Emergency	FY 2020 OCO Enacted	FY 2020 Total Enacted (Base+Emerg+ OCO)
Summary Recap of Budget Activities -----					
Management Support	377,001	227,700			227,700
Total Research, Development, Test & Evaluation	377,001	227,700			227,700
Summary Recap of FYDP Programs -----					
Research and Development	377,001	227,700			227,700
Total Research, Development, Test & Evaluation	377,001	227,700			227,700

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 FY 2021 President's Budget
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 Total Obligational Authority
 (Dollars in Thousands)

10 Feb 2020

	FY 2021 Base	FY 2021 OCO for Base Requirements	FY 2021 OCO for Direct War and Enduring Costs	FY 2021 Total OCO	FY 2021 Total (Base + OCO)
Summary Recap of Budget Activities -----					
Management Support	210,090				210,090
Total Research, Development, Test & Evaluation	210,090				210,090
Summary Recap of FYDP Programs -----					
Research and Development	210,090				210,090
Total Research, Development, Test & Evaluation	210,090				210,090

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

10 Feb 2020

Appropriation: 0460D Operational Test & Eval, Defense

Line No	Program Element Number	Item	Act	FY 2019 (Base + OCO)	FY 2020 Base Enacted	FY 2020 Emergency	FY 2020 OCO Enacted	FY 2020 Total Enacted S (Base+Emerg+ e OCO) c
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1	06051180	OTE Operational Test and Evaluation	06	85,685	93,291			93,291 U
2	06051310	OTE Live Fire Test and Evaluation	06	64,332	69,172			69,172 U
3	06058140	OTE Operational Test Activities and Analyses	06	226,984	65,237			65,237 U
		Management Support		377,001	227,700			227,700
				-----	-----	-----	-----	-----
				377,001	227,700			227,700
				-----	-----	-----	-----	-----
				377,001	227,700			227,700

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

10 Feb 2020

Appropriation: 0460D Operational Test & Eval, Defense

Line No	Program Element Number	Item	Act	FY 2021 Base	FY 2021 OCO for Base Requirements	FY 2021 OCO for Direct War and Enduring Costs	FY 2021 Total OCO	FY 2021 Total (Base + OCO)	Se
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1	06051180	OTE Operational Test and Evaluation	06	100,021				100,021	U
2	06051310	OTE Live Fire Test and Evaluation	06	70,933				70,933	U
3	06058140	OTE Operational Test Activities and Analyses	06	39,136				39,136	U
		Management Support		210,090				210,090	
		Total Operational Test & Eval, Defense		210,090				210,090	

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Operational Test and Evaluation, Defense • Budget Estimates FY 2021 • RDT&E Program

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

Appropriation 0460: Operational Test and Evaluation, Defense

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2	06	0605131OTE	Live Fire Test and Evaluation (LFT&E).....	Volume 5 - 7
3	06	0605814OTE	Operational Test Activities and Analyses.....	Volume 5 - 25

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Operational Test and Evaluation, Defense • Budget Estimates FY 2021 • RDT&E Program

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

Program Element Title	Program Element Number	Line #	BA	Page
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Operational Test Activities and Analyses	0605814OTE	3	06.....	Volume 5 - 25
Operational Test and Evaluation (OT&E)	0605118OTE	1	06.....	Volume 5 - 1

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Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Operational Test and Evaluation, Defense **Date:** February 2020

Appropriation/Budget Activity 0460: <i>Operational Test and Evaluation, Defense I BA 6: RDT&E Management Support</i>	R-1 Program Element (Number/Name) PE 0605118OTE <i>I Operational Test and Evaluation (OT&E)</i>
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COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	83.190	85.685	93.291	100.021	-	100.021	95.979	96.080	98.512	100.868	Continuing	Continuing
000310: <i>OT&E</i>	83.190	85.685	93.291	100.021	-	100.021	95.979	96.080	98.512	100.868	Continuing	Continuing

A. Mission Description and Budget Item Justification

The Director of Operational Test and Evaluation (DOT&E) was created by Congress in 1983. The Director is responsible under Title 10 for policy and procedures for all aspects of Operational Test and Evaluation (OT&E) within the Department of Defense (DoD). Particular focus is given to OT&E that supports major weapon system production decisions for acquisition programs included on the Office of Secretary of Defense Test and Evaluation Oversight List that is prepared and approved annually. Generally, there are about 235 programs on the oversight list including all Major Defense Acquisition Programs (MDAP) and Major Automated Information Systems (MAIS). MDAPs may not proceed beyond low-rate initial production (BLRIP) until OT&E of the program is complete. DOT&E is involved early in the planning phase of each program to ensure adequate testing is planned and executed. Key elements of DOT&E's oversight authority include:

- The approval of component Test and Evaluation Master Plans (TEMPS).
- The approval of component OT&E Test Plans (TPs).
- Oversight of Military Department preparation and conduct of field operational tests; analysis and evaluation of the resultant test data; the assessment of the adequacy of the executed test and evaluation programs; and assessment of the operational effectiveness and suitability of the weapon systems.
- Reporting results of OT&E that support BLRIP decisions to the Secretary of Defense and Congress, as well as providing an annual report summarizing all OT&E activities and the adequacy of test resources within DoD during the previous fiscal year.
- The review and development of recommendations to the Secretary of Defense on all budgetary and financial matters related to OT&E, including operational test facilities, resources and ranges.

DOT&E also oversees and resources OT&E community efforts to plan and execute joint operational evaluations of information assurance and interoperability (IA and IOP) of fielded systems and networks during major Combatant Command (CCMD) and Service exercises, and reports the trends and findings in the annual report.

DOT&E is also involved in increasing the capacity to access realistically advanced cyber warfighting capabilities to keep pace with heightened demand for those capabilities, advancing technologies and the growing cyber threat.

This Program Element includes funds to obtain Federally Funded Research and Development Center (FFRDC) support in performing the described tasks, travel funds to carry out oversight of the OT&E and IA and IOP programs, funds for Service teams performing information assurance and interoperability assessments during exercises, administrative support services, DFAS support, and engineering and technical support services related to the conduct of operational test and evaluation and exercise assessments.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Operational Test and Evaluation, Defense	Date: February 2020
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Appropriation/Budget Activity 0460: Operational Test and Evaluation, Defense / BA 6: RDT&E Management Support	R-1 Program Element (Number/Name) PE 0605118OTE / Operational Test and Evaluation (OT&E)
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B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	85.685	93.291	94.929	-	94.929
Current President's Budget	85.685	93.291	100.021	-	100.021
Total Adjustments	0.000	0.000	5.092	-	5.092
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Due to the Defense-wide Review (DWR), funding was realigned from 0605814OTE for digital modernization	-	-	5.122	-	5.122
• Due to the Defense-wide Review (DWR), FY 2021 Funding was reduced due to eliminating assembled chemical weapons alternatives program oversight	-	-	-0.030	-	-0.030

Change Summary Explanation

Due to the Defense-wide Review (DWR), FY 2021 Funding was realigned from 0605814OTE for digital modernization.

Due to the Defense-wide Review (DWR), FY 2021 Funding was reduced due to eliminating assembled chemical weapons alternatives program oversight.

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Operational Test and Evaluation, Defense										Date: February 2020		
Appropriation/Budget Activity 0460 / 6					R-1 Program Element (Number/Name) PE 0605118OTE / <i>Operational Test and Evaluation (OT&E)</i>				Project (Number/Name) 000310 / <i>OT&E</i>			
COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
000310: <i>OT&E</i>	83.190	85.685	93.291	100.021	-	100.021	95.979	96.080	98.512	100.868	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Director of Operational Test and Evaluation (DOT&E) was created by Congress in 1983. The Director is responsible under Title 10 for policy and procedures for all aspects of Operational Test and Evaluation (OT&E) within the Department of Defense (DoD). Particular focus is given to OT&E that supports major weapon system production decisions for acquisition programs included on the Office of Secretary of Defense Test and Evaluation Oversight List that is prepared and approved annually. Generally, there are about 235 programs on the oversight list including all Major Defense Acquisition Programs (MDAP) and Major Automated Information Systems (MAIS). MDAPs may not proceed beyond low-rate initial production (BLRIP) until OT&E of the program is complete. DOT&E is involved early in the planning phase of each program to ensure adequate testing is planned and executed. Key elements of DOT&E's oversight authority include:

- The approval of component Test and Evaluation Master Plans (TEMPS).
- The approval of component OT&E Test Plans (TPs).
- Oversight of Military Department preparation and conduct of field operational tests; analysis and evaluation of the resultant test data; the assessment of the adequacy of the executed test and evaluation programs; and assessment of the operational effectiveness and suitability of the weapon systems.
- Reporting results of OT&E that support BLRIP decisions to the Secretary of Defense and Congress, as well as providing an annual report summarizing all OT&E activities and the adequacy of test resources within DoD during the previous fiscal year.
- The review and development of recommendations to the Secretary of Defense on all budgetary and financial matters related to OT&E, including operational test facilities, resources and ranges.

DOT&E also oversees and resources OT&E community efforts to plan and execute joint operational evaluations of information assurance and interoperability (IA and IOP) of fielded systems and networks during major Combatant Command (CCMD) and Service exercises, and reports the trends and findings in the annual report.

DOT&E is also involved in increasing the capacity to access realistically advanced cyber warfighting capabilities to keep pace with heightened demand for those capabilities, advancing technologies and the growing cyber threat.

This Program Element includes funds to obtain Federally Funded Research and Development Center (FFRDC) support in performing the described tasks, travel funds to carry out oversight of the OT&E and IA and IOP programs, funds for Service teams performing information assurance and interoperability assessments during exercises, administrative support services, DFAS support, and engineering and technical support services related to the conduct of operational test and evaluation and exercise assessments.

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Operational Test and Evaluation, Defense		Date: February 2020	
Appropriation/Budget Activity 0460 / 6	R-1 Program Element (Number/Name) PE 0605118OTE / <i>Operational Test and Evaluation (OT&E)</i>	Project (Number/Name) 000310 / <i>OT&E</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020
Title: Operational Test and Evaluation		85.685	93.291
FY 2020 Plans: Operational Test and Evaluation Oversight This effort is in direct support of the Director's Title 10 responsibilities and is a continuing effort. Funding for FY 2020 provides Operational Test and Evaluation inputs for Test and Evaluation Master Plans, Test Plans, System Acquisition Reports, and Defense Acquisition Executive Summary Reports for those programs designated for oversight by DOT&E and OUSD(A&S). Key elements of DOT&E oversight authority are identified in Calendar Year 2020 Office of the Secretary of Defense Test and Evaluation Oversight List. Cyber Evaluations DOT&E plans to sponsor approximately 50 Combatant Command (CCMD) and Service cybersecurity assessments and Cyber Readiness Campaign (CRC) events in FY 2020, each including "Find-Fix-Verify" efforts to facilitate the remediation of identified vulnerabilities and verify that solutions and mitigations improve warfighter mission assurance. DOT&E plans to continue working with the CCMDs and Services to develop multiyear plans for exercise cyber assessments and CRC events. To support threat representative assessments, and to facilitate improvement of DoD's cybersecurity posture, DOT&E will continue efforts with U.S. Cyber Command to implement the Global Persistent Cyber Opposing Force (PCO) capability with authorities to perform year round and long-duration assessments of all CCMDs and Services. Primary objectives for DOT&E's assessments in FY 2020 include the portrayal of advanced nation-state cyber threats and the assessment of operational missions during realistic cyber attacks and any corresponding response actions to adversary attacks. DOT&E will assess Cyber Protection Teams and Cyber Mission Teams when they participate during PCO, CRC, or exercise events. DOT&E will continue to develop techniques to efficiently and effectively assess offensive cyber capabilities, conduct timely evaluations of these capabilities, and consider the development of a potential cyber variant of the Joint Munition Effectiveness Manual. DOT&E will transmit critical findings to DoD leadership along with recommended actions to improve DoD's cybersecurity posture. FY 2020 evaluations will include trend analyses across prior year results, both within and across CCMDs.		100.021	
FY 2021 Plans: Operational Test and Evaluation Oversight This effort is in direct support of the Director's Title 10 responsibilities and is a continuing effort. Funding for FY 2021 provides Operational Test and Evaluation inputs for Test and Evaluation Master Plans, Test Plans, System Acquisition Reports, Defense Acquisition Executive Summary Reports for those programs designated for oversight by DOT&E and OUSD(A&S). Key elements of DOT&E oversight authority will be identified in Calendar Year 2021 Office of the Secretary of Defense Test and Evaluation Oversight List.			

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Operational Test and Evaluation, Defense		Date: February 2020	
Appropriation/Budget Activity 0460 / 6	R-1 Program Element (Number/Name) PE 0605118OTE / <i>Operational Test and Evaluation (OT&E)</i>	Project (Number/Name) 000310 / <i>OT&E</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020
<p>As a result of the Defense-Wide Review (DWR), DOT&E will eliminate the assembled chemical weapon alternatives program oversight, saving \$30 thousand dollars per year.</p> <p>Cyber Evaluations DOT&E plans to sponsor approximately 50 CCMD and Service cybersecurity assessments and CRC events in FY 2021. Each assessment will continue to include "Find-Fix-Verify" efforts to facilitate the remediation of identified vulnerabilities and verify that solutions and mitigations improve warfighter mission assurance. DOT&E plans to continue working with the CCMDs and Services to develop multiyear plans for exercise cyber assessments and CRC events. These plans will focus on assessing the CCMD's or Service's ability to complete missions and be resilient in a contested cyber environment. DOT&E will perform year-round and long duration assessments of all CCMDs and Services with Global PCO authorities. Objectives for DOT&E assessments in FY 2021 will include the portrayal of advanced nation-state cyber threats and the assessment of operational missions during realistic cyber attacks, with supporting offensive fires and cyber-range events included in the evaluation. DOT&E will assess Cyber Protection Teams and Cyber Mission Teams when they participate during PCO, CRC, or exercise events. DOT&E will continue assessments of offensive cyber capabilities. DOT&E will transmit critical findings to DoD leadership along with recommended actions to improve DoD's cybersecurity posture. FY 2021 evaluations will include trend analyses across prior year results, both within and across CCMDs.</p> <p>Due to the Defense-wide Review (DWR), in FY 2021 funding was reduced by \$0.03 million due to eliminating assembled chemical weapons alternatives program oversight.</p> <p>Due to the Defense-wide Review (DWR), in FY 2021, DOT&E will reinvest \$5 million in digital modernization (e.g., automated software and cybersecurity testing, digital engineering, etc.) to engineer and drive pilots designed to move the operational test community into next generation digital technologies and analytic methods at scale.</p> <p><i>FY 2020 to FY 2021 Increase/Decrease Statement:</i> The increase from FY 2020 to FY 2021 of \$6.730 Million is due to funds realigned from 0605814OTE for digital modernization, as well as enhancements for enhanced Cyber Red teams and yearly inflation increases of program cost.</p>			
Accomplishments/Planned Programs Subtotals		85.685	93.291
C. Other Program Funding Summary (\$ in Millions) N/A			
Remarks			

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Operational Test and Evaluation, Defense		Date: February 2020
Appropriation/Budget Activity 0460 / 6	R-1 Program Element (Number/Name) PE 0605118OTE / <i>Operational Test and Evaluation (OT&E)</i>	Project (Number/Name) 000310 / <i>OT&E</i>
D. Acquisition Strategy N/A		

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Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Operational Test and Evaluation, Defense	Date: February 2020
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Appropriation/Budget Activity					R-1 Program Element (Number/Name)							
0460: Operational Test and Evaluation, Defense / BA 6: RDT&E Management Support					PE 0605131OTE / Live Fire Test and Evaluation (LFT&E)							
COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	58.950	64.332	69.172	70.933	-	70.933	70.297	72.989	74.001	75.034	Continuing	Continuing
000311: LFT&E	58.950	64.332	69.172	70.933	-	70.933	70.297	72.989	74.001	75.034	Continuing	Continuing

A. Mission Description and Budget Item Justification

This Program Element consists of three programs: Live Fire Test and Evaluation (LFT&E), Joint Aircraft Survivability Program (JASP), and Joint Technical Coordinating Group for Munitions Effectiveness (JTCEG/ME).

This Program Element directly supports the Congressional statutory requirements for oversight of LFT&E. The primary objective of LFT&E is to assure that the vulnerability and survivability of Department of Defense (DoD) crew-carrying platforms and the lethality of our conventional munitions are known and acceptable before entering full-rate production. LFT&E encompasses realistic tests involving actual United States (U.S.) and foreign threat hardware or, if not available, acceptable surrogate threat hardware. The objective is to identify and correct design deficiencies early in the development process. A completed LFT&E program and test report is required before programs proceed beyond low-rate initial production (BLRIP). LFT&E also includes realistic modeling and simulation (M&S) to examine survivability and lethality attributes not assessed during testing.

This Program Element also supports DoD's Joint Live Fire (JLF) Program and other LFT&E related initiatives. JLF was initiated in 1984 under an Office of the Secretary of Defense charter to test fielded front-line combat aircraft and armor systems for their vulnerabilities as well as fielded weapons, both U.S. and foreign, for their lethality against their respective targets. Funds are also used to support other initiatives related to quick reaction requests from theater and other areas of personnel survivability.

The Joint Aircraft Survivability Program is the DoD's focal point for joint service enhancement of military aircraft non-nuclear survivability. The JASP is chartered by the commanders of the USN Naval Air Systems Command, USA Aviation and Missile Command, and USAF Life Cycle Management Center to increase the affordability, readiness, and effectiveness of Tri-Service aircraft through joint coordination and development of survivability technologies, design tools and assessment methodologies. The JASP coordinates and conducts RDT&E to improve military aircraft survivability, develop and standardize aircraft survivability modeling and simulation (M&S), facilitate information exchange on aircraft survivability, and support aircraft survivability education for the DoD and U.S. aircraft community. Each chartering command provides a senior aircraft survivability expert for the JASP Principal Members Steering Group (PMSG), which guides the program and approves projects for funding. The JASP assesses and reports on combat damage incidents through the Joint Combat Assessment Team (JCAT) and is the Executive Agent for the Joint Live Fire Aircraft Systems Program managed by the Live Fire Test office of DOT&E.

The Joint Technical Coordinating Group for Munitions Effectiveness (JTCEG/ME) was chartered 50 years ago to serve as Department of Defense's (DoD's) focal point for munitions effectiveness information. The JTCEG/ME produces Joint Munitions Effectiveness Manuals (JMEMs) that are the sole source for all Joint Service Authenticated non-nuclear weapons effectiveness data and methodology for DoD. The JMEMs are the "how to" manuals for putting ordnance on target and as such, directly impacts combat readiness, effectiveness, and survivability. JMEMs are used by the Warfighters in operational weaponeering and collateral damage estimation calls in direct support of operations, mission planning, and training; by the DoD, Joint, and Service planners in force-on-force modeling, mission area analysis, requirements studies and weapon procurement planning; and by the service acquisition community in performance assessment, analysis of alternatives and survivability enhancement

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Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Operational Test and Evaluation, Defense	Date: February 2020
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Appropriation/Budget Activity 0460: <i>Operational Test and Evaluation, Defense / BA 6: RDT&E Management Support</i>	R-1 Program Element (Number/Name) PE 0605131OTE / <i>Live Fire Test and Evaluation (LFT&E)</i>
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studies. The JTCG/ME continually evolves weapons effectiveness and target vulnerability data, standards, methodologies, and processes based on the strategic environment for better munitions effectiveness evaluation and support to a more lethal force. JTCG/ME also increases efficiency by leveraging ongoing Department efforts and supporting the Department's intent to complement U.S. interest and capabilities by providing weaponeering and targeting capability to Coalition partners. The JMEM requirements and development processes are driven by operational lessons learned (Inherent Resolve, Resolute Support and Freedom Sentinel), Joint Staff Data Call and the needs of Combatant Commands (CCMDs), Services, Military Targeting Committee (MTC) guided by Chairman of the Joint Chiefs of Staff Instruction (CJCSI) 5140.01, Munitions Requirements Process (MRP) - DoD Instruction (DoDI) 3000.04 and Operational Users Working Groups (OUWGs) input for specific weapon-target pairings and methodologies. Considerable effort goes into these user forums to establish Warfighter requirements for current and future JTCG/ME products, as well as continued training events and day-to-day support -- all with the goal of enabling greater force lethality, strengthening partner capabilities, and optimal use of resources.

This program element also includes funds to obtain Federally Funded Research and Development Center (FFRDC) expertise in performing analyses in support of described Live Fire Test and Evaluation tasks, as well as travel funds to carry out the LFT&E, JASP, and JTCG/ME programs.

B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	64.332	69.172	70.933	-	70.933
Current President's Budget	64.332	69.172	70.933	-	70.933
Total Adjustments	0.000	0.000	0.000	-	0.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Operational Test and Evaluation, Defense										Date: February 2020		
Appropriation/Budget Activity 0460 / 6					R-1 Program Element (Number/Name) PE 0605131OTE / <i>Live Fire Test and Evaluation (LFT&E)</i>				Project (Number/Name) 000311 / <i>LFT&E</i>			
COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
000311: <i>LFT&E</i>	58.950	64.332	69.172	70.933	-	70.933	70.297	72.989	74.001	75.034	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Program Element consists of three programs: Live Fire Test and Evaluation (LFT&E), Joint Aircraft Survivability Program (JASP), and Joint Technical Coordinating Group for Munitions Effectiveness (JTCEG/ME).

This Program Element directly supports the Congressional statutory requirements for oversight of LFT&E. The primary objective of LFT&E is to assure that the vulnerability and survivability of Department of Defense (DoD) crew-carrying platforms and the lethality of our conventional munitions are known and acceptable before entering full-rate production. LFT&E encompasses realistic tests involving actual United States (U.S.) and foreign threat hardware or, if not available, acceptable surrogate threat hardware. The objective is to identify and correct design deficiencies early in the development process. A completed LFT&E program and test report is required before programs proceed beyond low-rate initial production (BLRIP). LFT&E also includes realistic modeling and simulation (M&S) to examine survivability and lethality attributes not assessed during testing.

This Program Element also supports DoD's Joint Live Fire (JLF) Program and other LFT&E related initiatives. JLF was initiated in 1984 under an Office of the Secretary of Defense charter to test fielded front-line combat aircraft and armor systems for their vulnerabilities as well as fielded weapons, both U.S. and foreign, for their lethality against their respective targets. Funds are also used to support other initiatives related to quick reaction requests from theater and other areas of personnel survivability.

The Joint Aircraft Survivability Program is the DoD's focal point for joint service enhancement of military aircraft non-nuclear survivability. The JASP is chartered by the commanders of the USN Naval Air Systems Command, USA Aviation and Missile Command, and USAF Life Cycle Management Center to increase the affordability, readiness, and effectiveness of Tri-Service aircraft through joint coordination and development of survivability technologies, design tools and assessment methodologies. The JASP coordinates and conducts RDT&E to improve military aircraft survivability, develop and standardize aircraft survivability modeling and simulation (M&S), facilitate information exchange on aircraft survivability, and support aircraft survivability education for the DoD and U.S. aircraft community. Each chartering command provides a senior aircraft survivability expert for the JASP Principal Members Steering Group (PMSG), which guides the program and approves projects for funding. The JASP assesses and reports on combat damage incidents through the Joint Combat Assessment Team (JCAT) and is the Executive Agent for the Joint Live Fire Aircraft Systems Program managed by the Live Fire Test office of DOT&E.

The Joint Technical Coordinating Group for Munitions Effectiveness (JTCEG/ME) was chartered 50 years ago to serve as Department of Defense's (DoD's) focal point for munitions effectiveness information. The JTCEG/ME produces Joint Munitions Effectiveness Manuals (JMEMs) that are the sole source for all Joint Service Authenticated non-nuclear weapons effectiveness data and methodology for DoD. The JMEMs are the "how to" manuals for putting ordnance on target and as such, directly impacts combat readiness, effectiveness, and survivability. JMEMs are used by the Warfighters in operational weaponeering and collateral damage estimation calls in direct support of operations, mission planning, and training; by the DoD, Joint, and Service planners in force-on-force modeling, mission area analysis, requirements studies and weapon procurement planning; and by the service acquisition community in performance assessment, analysis of alternatives and survivability enhancement

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<p>studies. The JTCG/ME continually evolves weapons effectiveness and target vulnerability data, standards, methodologies, and processes based on the strategic environment for better munitions effectiveness evaluation and support to a more lethal force. JTCG/ME also increases efficiency by leveraging ongoing Department efforts and supporting the Department's intent to complement U.S. interest and capabilities by providing weaponeering and targeting capability to Coalition partners. The JMEM requirements and development processes are driven by operational lessons learned (Inherent Resolve, Resolute Support and Freedom Sentinel), Joint Staff Data Call and the needs of Combatant Commands (CCMDs), Services, Military Targeting Committee (MTC) guided by Chairman of the Joint Chiefs of Staff Instruction (CJCSI) 5140.01, Munitions Requirements Process (MRP) - DoD Instruction (DoDI) 3000.04 and Operational Users Working Groups (OUWGs) input for specific weapon-target pairings and methodologies. Considerable effort goes into these user forums to establish Warfighter requirements for current and future JTCG/ME products, as well as continued training events and day-to-day support -- all with the goal of enabling greater force lethality, strengthening partner capabilities, and optimal use of resources.</p> <p>This program element also includes funds to obtain Federally Funded Research and Development Center (FFRDC) expertise in performing analyses in support of described Live Fire Test and Evaluation tasks, as well as travel funds to carry out the LFT&E, JASP, and JTCG/ME programs.</p>			
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020
<p>Title: Live Fire Test and Evaluation</p> <p>FY 2020 Plans:</p> <p>Live Fire Test and Evaluation (LFT&E) of Major Department of Defense (DoD) Acquisition Programs</p> <p>The FY 2020 budget will enable the LFT&E Deputate to: (1) assess the adequacy of programs' test and evaluation plans and generate new test and evaluation policies, as needed; (2) review and analyze the test data to support an independent evaluation of the survivability/lethality of the systems in support of the development of OSD Live Fire Test and Evaluation reports to Congress; and (3) review major acquisition plans, reports, and requirement documents to inform system design and capability development.</p> <p>JLF Programs and LFT&E Initiatives</p> <p>The FY 2020 JLF budget will support at least 20 projects (tentatively 8 new efforts and 12 projects continuing from previous FYs). Project's objectives will directly support NDS objectives to include building a more lethal force, new partnerships, or DoD business reforms.</p> <p>Build a More Lethal Force</p> <p>In FY 2020, JLF will continue to increase the accuracy and capability of critical modeling and simulation tools to support test and evaluation efficiency and ensure credibility of DOD assessments and weaponeering tools.</p> <p>- For example, one effort will increase the capability of existing naval M&S survivability and lethality evaluation tools. More specifically the project will develop more accurate damage effects as the threat penetrates multiple ship compartments, as typically seen in a realistic engagement.</p>		64.332	69.172
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<p>- Another effort will increase the capability of existing M&S tools used to evaluate fire propagation across ship compartments and the ensuing threat to the ship/occupants, as well as recoverability capabilities pertaining to the damage caused by spreading fires.</p> <p>JLF efforts will also continue to resolve survivability and lethality related system design challenges of currently fielded U.S. systems.</p> <p>- For example, one JLF effort will address an evaluation shortfall related to body armor performance. Existing LFT&E methods do not adequately correlate body armor data to actual injury. This task will support the development of appropriate measures, techniques, and analyses to enable a more credible correlation of body armor data with injury.</p> <p>- JLF will enable the development of more rigorous test infrastructure needed to evaluate the effectiveness of fuel self-sealing bladders with aircraft. Self-sealing bladders could significantly mitigate the vulnerability to the aircrew. This test infrastructure will ensure self-sealing bladder's performance is more accurately characterized prior to final design reviews.</p> <p>Reform the Department for Greater Performance and Affordability</p> <p>In coordination with the Army and the Air Force, JLF will increase aircraft and ground combat vehicle survivability/lethality M&S.</p> <p>- One effort will apply innovative techniques to increase the efficiency of existing M&S tools largely used to estimate lethality of piercing threats against our systems. Improved lethality models will increase the credibility of our lethality evaluations and the credibility of weapon engineering tools.</p> <p>JLF will also continue to lead innovation in LFT&E methods to increase LFT&E efficiency and support rapid fielding.</p> <p>- A new effort will develop an advanced teaming analysis capability to enable future survivability and lethality evaluations of a system-of-systems. Current LFT&E has limited capability to assess the effectiveness of the system in the context of other supporting systems. LFT&E is currently constrained to single system analyses, which is not always operationally representative.</p> <p>- Another new JLF effort will provide an M&S capability that will enable efficient evaluation of active protection systems integrated with ground combat vehicles.</p> <p>- JLF will develop machine learning algorithms to more effectively characterize armor performance. Such algorithms will enable efficient LFT&E of future armor compositions and will inform future armor designs.</p> <p>JASP</p> <p>In FY 2020 the JASP will continue work on 27 multi-year RDT&E projects and initiate 13 new projects approved by the JASP Principal Members Steering Group and OSD/DOT&E. The JASP will support the NDS objective to 'Build a More Lethal Force' by developing measures to defeat Near-Peer Adversary Threat (N-PAT) radio-frequency and infrared guided threats coupled with quantifiable improvements in digital and hardware in the loop modeling and simulation capability and credibility. Improve aircraft force protection by advancing system hardening against rocket-propelled grenade, small-arms, and high-energy laser threats and increasing threat and flight environmental situational awareness. Reform the DoD for Greater Performance and Affordability by</p>			

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<p>funding the development of more efficient M&S tools and threat models to enable more effective aircraft survivability capability development, test and evaluation.</p> <p>The Joint Combat Assessment Team (JCAT) will continue to support the Air Force, Army, Marine Corps and Navy by assessing combat damage incidents, training operators on threat effects and combat damage assessment, and reporting their findings to combatant commanders and the DoD science and technology and acquisition communities. The JASP will continue supporting aircraft survivability education and information exchange through internet sites (restricted access and classified), by publishing the Aircraft Survivability Journal, developing educational materials and conducting training for the DoD and their contractors. The JASP will initiate, continue, and complete other projects as approved by the JASP Principal Members Steering Group and OSD/ DOT&E.</p> <p>Joint Technical Coordinating Group for Munitions Effectiveness In FY 2020, JTCCG/ME efforts will continue to assist the Director, Operational Test and Evaluation (DOT&E), Office of the Secretary of Defense (OSD) in supporting the National Defense Strategy lines of effort of enabling greater force lethality, strengthening partner capabilities, and optimal use of resources through efficiency.</p> <p>JTCCG/ME will:</p> <ul style="list-style-type: none"> -Develop, enhance, and standardize data/methodologies for evaluating munitions effectiveness. This includes target vulnerability characterization, munitions lethality, weapon system accuracy, and specific weapon-target pairings driven primarily from current operational lessons learned, Joint Staff Data Calls, and Combatant Commands' (CCMDs) needs. -Field and continue to enhance future versions of its kinetic JTCCG/ME Joint Munitions Effectiveness Manual (JMEM) products to include the JMEM Weaponizing System (JWS), Joint Anti-air Combat Effectiveness (J-ACE), Digital Precision Strike Suite (DPSS) Collateral Damage Estimation (DCiDE) tool, and the Digital Imagery Exploitation Engine (DIEE). -Develop non-kinetic JMEMs capability to include Cyber Operations Lethality and Effectiveness (COLE) and Joint Laser Weaponizing Software (JLaWS) products, as well as High Power Microwave (HPM) and Electromagnetic Spectrum (EMS) Fires data/tool sets. -Support specialized solutions to address operational needs to include direct analytical support to operations, Probability of kill (Pk) Lookup Tools, Collateral Damage Estimation (CDE) analysis and tables, and air-to-surface and surface-to-surface weaponizing guides. -Continue to execute a multi-year test program to enhance weaponizing/collateral damage estimation in complex environments. -Improve the utilization of Battle Damage Assessment (BDA) data to more effectively and efficiently estimate munition expenditure rates and mitigate stockpile stress, while improving CCMDs' force effects. -Continue to maintain and strengthen relationships with the Warfighter, operational users, and coalition partners to establish requirements for current and future products, through forums, training, foreign military sales, and reachback operational support. 			

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<p>The objective is to provide efficient and effective support to meet CCMD current and future needs for agility and greater lethality in a more dynamic combined operational environment.</p> <ul style="list-style-type: none"> -Increase efficiency by leveraging ongoing Department efforts and support the Department's intent to complement U.S. interest and capabilities by providing weaponeering, targeting, and collateral damage estimation (prevent civilian casualties) capability to Coalition partners through foreign military sales. -Continue to build and implement the next JTCG/ME JMEM product lines on a foundation of effects libraries using software frameworks enabling quicker development, flexibility, leveraging, and tailoring. -Study and implement the use of machine learning and data analytics to improve quality of existing solutions, decrease computation time of applications, and answer questions previously not possible. <p>Specifically in FY 2020, JTCG/ME plans to:</p> <ul style="list-style-type: none"> -Sustain/support fielded JWS v2.3.1, with efforts including multiple training and user forums for the fielded product. -Field JWS v2.4/develop JWS v2.4.x updates (as needed), which provides enhanced data, Fast Integrated Structural Tool (FIST), and connectivity capabilities, while maximizing the final JWS v2.x product line as the future weaponeering product line is developed/completed. Specific highlights include interim enhanced database capabilities with updated data sets to include CCMD's high priority calculated, refreshed, and surrogated targets. The enhanced database capabilities allow accelerated, out of production cycle weapons and target data updates, tailored product versions for releasability, and more effective, focused testing. New capabilities include Hard Target Void Sensing Fuze and trajectory model updates, as well as FIST v2.4 with several expanded methodologies for structural target response variables. These capabilities enable more options to the weaponeer and improve the underlying phenomenology representation in JWS. -Facilitate coalition interoperability and information exchange forums. JTCG/ME will deliver JWS version releases and standalone Pk Lookup tools to coalition partners in support of current operations under Foreign Military Sales agreements. These deliveries increase efficiency by leveraging ongoing Department efforts and supporting the Department's intent to complement U.S. interest and capabilities by providing weaponeering/targeting and collateral damage estimation capability to Coalition partners, as well as improve the effectiveness of U.S. fires and targeting personnel working in combined environments. JTCG/ME will also hold information exchange forums via information exchange agreements (IEAs) with the United Kingdom and Republic of Korea. These exchanges facilitate collaboration on methodologies and efforts of mutual interest in the area of weapons effectiveness/collateral damage estimation. These efforts will directly support Presidential Conventional Arms Control Policy to build partner capacity to prevent civilian casualties. -Develop and enhance processes to supply target vulnerability data to operational and acquisition communities. The JTCG/ME conducts detailed vulnerability analysis to produce tri-service approved target vulnerability information (i.e., Target Geometric Model (TGM) development, Failure Analysis Logic Tree (FALT), Failure Mode, Effects, and Criticality Analysis (FMECA), etc.). These data are used to feed the approved vulnerability models to generate the target data used on JMEMs. In addition, acquisition programs leverage JTCG/ME target vulnerability data to conduct detailed analysis of their new capabilities against 		<table border="1"> <thead> <tr> <th>FY 2019</th><th>FY 2020</th><th>FY 2021</th></tr> </thead> <tbody> <tr> <td></td><td></td><td></td></tr> </tbody> </table>	FY 2019	FY 2020	FY 2021			
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<p>threat targets. Similarly, JTCG/ME leverages target vulnerability modeling capabilities developed during acquisition. The leveraging of this information saves programs and JTCG/ME valuable time and resources, and ensures the acquisition and operational communities are using consistent/valid threat representation and similar vulnerability/lethality modeling capabilities. A significant focus of FY 2020 efforts will be planning and transition of target vulnerability capabilities to the JMEM Effects Library (JEL) for use on next generation weaponeering and targeting JMEMs.</p> <p>-Support urgent operational needs for target vulnerability data with rapid response surrogation and development of Pk Lookup data for high priority weapons and targets. These specialized products directly assist CCMDs to meet the operational requirements of a dynamic environment.</p> <p>-Continue to collect/improve, approve, and supply weapons characteristics data and standards for the tri-service community to include soon to be fielded systems. These weapons are: Small Diameter Bomb (SDB) II; Small Glide Munition (SGM) GBU-69; Focused Lethality Munition (FLM) GBU-39; Joint Air-to-Ground Missile (JAGM); Joint Multiple Effects Warhead System (JMEWS); Advanced Anti-Radiation Guided Missile (AARGM); and High speed Anti-Radiation Missile (HARM). JTCG/ME also continues to monitor future weapon systems to work longer lead methodology needs. A significant focus of FY 2020 efforts will be planning and transition of weapons characteristics capabilities to the JEL (database design, integration, and interfaces) for use on next generation weaponeering and targeting JMEMs.</p> <p>-Enhance weapons characterization processes and communication through the JTCG/ME Test Assistance Group (TAG). The TAG provides a forum that fuses science and art of weapon testing with subject matter experts from all the services and test ranges to review, adopt technologies and methods that reduce expense, time, anomalies, and expanded data collection. JTCG/ME archives and publishes these weapon characterization standards in updates to the JTCG/ME Weapon Test Procedures Manual (TPM) used by weapon test ranges. The TAG also facilitates partnerships and leveraging with Program Managers, Program Executive Offices, and Service Program Offices. These technologies and partnerships have the potential to reduce the number of weapon test articles required and remove labor-intensive activities from weapon testing.</p> <p>-Maintain, update, and execute strategic roadmaps for underlying vulnerability / lethality models used as standards by the tri-service community to better support JMEM development and Live Fire Testing and Evaluation (LFT&E). These roadmaps align JTCG/ME funded and related tasks by other services and programs to facilitate leveraging. In addition, the roadmaps provide a tool for future investment planning to support modeling / simulation validation and resolution of capability gaps. A key roadmap component includes several interconnected model sensitivity studies. The goal of these studies is to understand the range of potential model outputs, including stochastic variations in penetration and other processes, so that differences between test data and predictive models can be better understood.</p> <p>This will be used to guide live fire testing requirements for validation of the models for a program office's specific operational envelope. These studies will also provide data to support several model reaccreditations.</p> <p>-Develop and accredit Collateral Effects Radii (CER) Reference Tables in accordance with the Chairman of the Joint Chiefs of Staff Instruction (CJCSI) 3160.01 series, "No-Strike and the CDE Methodology" for air-to-surface and surface-to-surface weapons, which are the basic data that support the CDE methodology. The JTCG/ME CER tables and CDE methodology are used in</p>			

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<p>every planned kinetic strike in all Areas of Responsibility Operation (AORs) to meet Commanders' intent and to minimize civilian casualties. As such, it is critical to the Warfighters' ability to meet urgent operational needs. JTCG/ME implements the CER and CDE methodology within the DCiDE tool. DCiDE is an accredited automated CDE tool that expedites and simplifies the CDE process. DCiDE enables JTCG/ME to continuously support the CJCSI 3160.01 series, DCiDE was the only automated CDE tool authorized for use in the USCENTCOM and USAFRICOM AORs.</p> <p>-Maintain and support DIEE v2.2.1 product. DIEE is designated by CCMD Action Group (CCAG) as DoD solution for Advanced Target Development (ATD). DIEE provides both seamless planning and linkage to various mission planning systems and tools in operational units. It is a "Government off the shelf" (GOTS) product for advanced target development that integrates Target Coordinate Mensuration (TCM), CDE, Weaponing, and data basing functions. DIEE was selected as the preferred operational solution of a 2018 Air Force Advanced Target Development (ATD) Software Fly-off based on 135 hours of hands-on time and 451 scored line items. The Chairman of the Joint Chiefs of Staff issued guidance stating that, "The Services, Combatant Commands, and Combat Support Agencies will upload and use DIEE v2.1 for automated CDE to comply with the updated methodology and reporting requirement." DIEE v2.1.1 includes user requested enhancements, more advanced JWS interface for weaponing capability, CJCSI 3160.01C compliant CER Reference Tables and DCiDE for CDE capability, and updated Common Geopositioning Services (CGS) for TCM capability. A significant update in DIEE v2.2.1 is implementation and integration of mitigation tables for CDE. These mitigation tables, codified for use in CJCSI 3160.01C, are weapon and target specific, and allow for more accurate civilian casualty estimates for consideration by the strike authority. DIEE v2.2.1 supports various mitigation techniques that provide increased operational flexibility within the context of Theater Rules of Engagement and the Laws of Armed Conflict.</p> <p>-Continue to develop future DIEE versions (v2.x/v3.x) that will include: CGS updates, 3-D viewer for pre- and post- processing of weaponing and CDE mitigation analyses, interfacing to future JEL capability for weaponing, updates to Collateral Effects Library (CEL) interface, battle damage assessment workflow and graphic production, route tool user requested enhancements, and mobile tablet capabilities. JTCG/ME maintains Warfighter support and future requirements collection through training and User forums. A focus of FY 2020 efforts will be the transition of CJCSI 3160.01C to CJCSI 3160.01D and the impact on CERs and DCiDE implementation.</p> <p>-Continue to leverage CEL and other high fidelity weaponing/CDE techniques to deliver analysis packages for collateral damage mitigation, post-forensic, and force protection analyses packages to operational Users for high value targets in current operations. These efforts directly assist Combatant Commands to meet commander's intent and minimize collateral damage.</p> <p>-Continue the Enhanced Weaponing and CDE Program, a multi-year test program focused on enhancing and validating JTCG/ME CDE tools. This program will support improvements in weaponing methodology to minimize risk to mission and risk to forces, while not increasing risk of collateral damage, by providing foundational data for the development of higher fidelity predictive tools. Specific efforts will generate buried ordnance characterization data based upon usage statistics from CCMD Expenditure reports, and AOR specific building debris data to enhance and validate current weaponing/collateral damage estimation methodologies required by Strike Approval Authorities. FY 2020 efforts leverage nine FY 2019 testing events and</p>				

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<p>multiple collaboration forums. FY 2020 tests will include three buried ordnance tests to evaluate the effects of burial and weapon class on warhead performance, crater ejecta, and collateral damage, and four building debris characterization tests. A focused effort of FY 2020 is transition of previous years' analyzed and processed data to methodologies and future JMEM products.</p> <p>-Continue to implement the BDA of Deliberate and Dynamic Strikes analysis efforts. These efforts are multi-year task to analyze ongoing strikes required to update JMEM capabilities. The overall objective is to ensure effective and efficient munition expenditure rates and mitigate the stockpile stress, while improving CCMDs' force effects. This will improve the warfighter's ability to get the right weapon on the right target, achieve the desired effect, and minimize collateral damage while optimizing scarce resources. The analysis approach includes: 1) establishing an analytical cell to provide a detailed and usable Department-level combat assessment of past, current, and future strikes/weapons employments, 2) establishing an archival database that captures the pre- and post-strike assessments of these engagements, in a format that will be called upon by DIEE to select strike packages with optimal and efficient munition expenditures, and 3) guiding tactics improvement for evolving environments and methodology development to improve weaponeering tools. FY 2020 efforts include configuring cloud computing environment for BDA data/web tools, aggregating strike data and migrating to cloud, improving/automating data collection process, developing methodologies for multiple use cases, automating portions of strike analysis methodology, obtaining user feedback on web interface/tools and new BDA requirements, refining interface/tools based on User feedback, and refining accuracy of weapons effects/tools based on BDA results.</p> <p>-Sustain/support fielded J-ACE v5.3/v5.3.1. J-ACE, which includes the Joint Antiair Model (JAAM) and Endgame Manager (EM) modules. J-ACE provides two-sided air-to-air/surface-to-air combat effectiveness capability to underpin air combat tactics, techniques, and procedures development, as well as support mission analysis, studies, and training. Many users leverage J-ACE's Application Program Interface (API) to link debrief and analysis tools at training and test ranges across the Joint community. FY 2020 efforts will include multiple training and user forums for the fielded product. These forums are pivotal for J-ACE developers to understand requirements, and align development with other external debrief/analytical capabilities that use J-ACE as the underlying analytical engine to underpin results. The forums allow J-ACE external application developers to receive any updates and interact with J-ACE developer to refine requirements and plans.</p> <p>-Finish J-ACE v5.4 development. Further J-ACE v5.4 product development will maximize the final J-ACE v5.x product line, and continue to deliver User with new capability, as the future v6.x product is developed/completed. J-ACE v5.4 will include updated weapons and aircraft data in JAAM, new cross platform BROWSE module, which contains descriptive information for each player (weapon, aircraft). In addition, J-ACE v5.4 will include a new EM module that simulates terminal effects of the weapon lethality and target vulnerability. The faster EM has improved speed of new fuze model and refined graphic display data generation, and includes more weapon lethality-target vulnerability data sets. Other capabilities will include time, space, and position information (TSPI) file updates and filtering/error identification, aircraft maneuver updates, new input/output control options for a "war room summary sheet, and initial air-to-surface weapon (ASW) fly out models.</p> <p>-Further development of the Air Combat Effectiveness Library (ACEL) and the next J-ACE product series capabilities, known as J-ACE v6.x. Future JTCG/ME product lines (applications) are being designed and built on a foundation of effects libraries, which</p>					

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<p>are collections of JTCG/ME approved data, models, and methods/capabilities. Effects libraries are integrated using software frameworks, which support plug-in style methodologies enabling maximum modularity, flexibility of design, and reuse of standard capabilities across the community for greater performance and affordability. ACEL uses Hybrid Interactive Visualization Engine (HIVE) as its software architecture, which is used by others in the aircraft survivability community, enabling greater leveraging. ACEL will serve as the underlying analytical engine for weapons shot-logic/effect and weapons/aircraft kinematic calculations, while J-ACE v6.x and application interfaces will enable Users to interact with and use ACEL capabilities in a tailored software application to predict air combat effectiveness. FY 2020 efforts and deliverables will include continued review/approval of transported v5.x capabilities to ACEL and continued development of new v6.x capabilities. J-ACE v6.0 threshold capabilities include unmanned aerial system features, enhanced weapon engagement zone methodology, new graphical displays, refined terrain masking options, and auto-generated test reports for each product player. J-ACE v6.0 objective capabilities include enhanced air-to-air missile modeling capability, more ASW fly outs, updated/new surface-to-air models, updated enhanced surface-to-air missile simulation (ESAMS) capability with more counter measures, and target detection capability leveraging National Air and Space Intelligence Center (NASIC) Radio Frequency (RF) models/data. Longer -lead development items include infrared detection/track, red surf-to-air gun modeling in EM, rotary wing aero performance modeling, and enhanced chaff modeling.</p> <p>-Continue to mature Cyber JMEM capabilities with continued execution of multiyear plan to develop the COLE tool. FY 2020 efforts will focus completion of capability drop (CD) 2 efforts to include: advanced calculations incorporating quantification of uncertainties, ingest and generate operational environment model (OEM) data, prototype functional and beta tests, advanced uncertainty modeling (Monte Carlo, etc.), and computation of path-to-target estimate. In addition, FY 2020 will begin development of CD 3 that will include automated fusion of multi-domain estimates, correlation of foundational data to support OEM generation, preliminary artificial intelligence-based decision support system, OEM analysis and attack planning support, refined integration with other JTCG/ME toolsets, and quantitative comparisons. Similar to other JMEMs, User feedback is critical. FY 2019 COLE Functional Users Working Group prioritized requirements are driving development for CD 2. FY 2020 will include multiple Working Groups to review development with operators.</p> <p>-Initialize a JMEM program for EMS Fires. This effort will start in FY 2020 and is in response to Joint Requirements Oversight Council Memorandum (JROCM) 061-18 requesting Joint Munitions Effectiveness Manual (JMEM) for EMS Fires. CCMD mission planners require the ability to employ both kinetic and electronic attack (EA) methods to prosecute/affect advisory targets in contested EMS environments. Mission planners must be able to compare options side-by-side to have confidence in the effectiveness and understand associated risk. JTCG/ME will develop JMEMs capability for EMS Fires allowing mission planners to assess weapon/combat effectiveness in the presence of adversary EA on kinetic weapon guidance systems (i.e., Global Positioning System (GPS) Jamming), and to assess our EA capabilities against adversary targets (i.e., EMS Fires - EA Jamming). JTCG/ME will review and leverage existing models and data sets, where applicable, to build this capability. In addition, JTCG/ME will use kinetic weapon JMEM development model: 1) requirement collection/prioritization via Operational Users Working Groups, 2) Tri-service coordination, 3) leveraging/enhancing existing data/methodology, and 4) Joint standardization/approval.</p>			

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020
<p>JTCG/ME will look to provide immediate capability, while developing/executing a long-term strategy for sustained JMEMs for EMS fires capabilities to inform the planning and requirements processes. FY 2020 efforts will include 1) developing EMS Fires JMEM strategy and plan, 2) collecting/coordinating requirements, 3) initiation of Tri-service team to review/approve data/methods, formulate processes to codify in charter/terms of reference, 4) further understanding current data sources/models, 5) building partnerships for data collection, 6) executing proofs-of-concepts, and 7) providing initial capability with weapon guides and data collection gaps/shortfalls.</p> <p>FY 2021 Plans: Live Fire Test and Evaluation (LFT&E) of Major Department of Defense (DOD) Acquisition Programs The FY 2021 budget will enable the LFT&E Deputate to assess the adequacy of LFT&E strategies/plans and generate new LFT&E policies to support systems' acquisitions and rapid fielding. The FY 2021 budget will ensure an adequate execution of the agreed upon LFT&E plans and subsequently ability to conduct independent analysis of survivability and lethality test and M&S data in support of the development of OSD Live Fire Test and Evaluation reports to Congress.</p> <p>JLF Programs and LFT&E Initiatives</p> <p>The FY 2021 budget will support a more lethal force by increasing the accuracy and capability of critical modeling and simulation tools to support test and evaluation efficiency and ensure credibility of DOD assessments and weapon engineering tools. JLF efforts will also resolve survivability and lethality related system design challenges of currently fielded U.S. systems. Finally, JLF will continue to lead innovation in LFT&E methods to increase LFT&E efficiency and support rapid fielding.</p> <p>JASP In FY 2021 the JASP will continue work on at least 25 multi-year RDT&E projects and initiate about 8 new projects approved by the JASP Principal Members Steering Group and OSD/DOT&E. The JASP will support the NDS objective to 'Build a More Lethal Force' by developing measures to defeat Near-Peer Adversary Threat (N-PAT) radio-frequency and infrared guided threats coupled with quantifiable improvements in digital and hardware in the loop modeling and simulation capability and credibility. Improve aircraft force protection by advancing system hardening against rocket-propelled grenade, small-arms, and high-energy laser threats and increasing threat and flight environmental situational awareness. Reform the DoD for Greater Performance and Affordability by funding the development of more efficient M&S tools and threat models to enable more effective aircraft survivability capability development, test and evaluation.</p> <p>The JCAT will continue to support the Air Force, Army, Marine Corps and Navy by assessing combat damage incidents, training operators on threat effects and combat damage assessment, and reporting their findings to combatant commanders and the DoD science and technology and acquisition communities. The JASP will continue supporting aircraft survivability education and</p>			

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Operational Test and Evaluation, Defense		Date: February 2020	
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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020
<p>information exchange through internet sites (restricted access and classified), by publishing the Aircraft Survivability Journal, developing educational materials and conducting training for the DoD and their contractors. The JASP will initiate, continue and complete other projects as approved by the JASP Principal Members Steering Group and OSD/DOT&E.</p> <p>Joint Technical Coordinating Group for Munitions Effectiveness In FY 2021, JTTCG/ME efforts will continue to assist the DOT&E, OSD in supporting the National Defense Strategy lines of effort of enabling greater force lethality, strengthening partner capabilities, and optimal use of resources through efficiency.</p> <p>JTTCG/ME will:</p> <ul style="list-style-type: none"> -Develop, enhance, and standardize data/methodologies for evaluating munitions effectiveness. This includes target vulnerability characterization, munitions lethality, weapon system accuracy, and specific weapon-target pairings driven primarily from current operational lessons learned, Joint Staff Data Calls, and CCMDs' needs. -Field and continue to enhance future versions of its major JTTCG/ME Joint Munitions Effectiveness Manual (JMEM) products, the JWS, J-ACE, DCiDE tool, and DICE. - Develop non-kinetic JMEMs capability to include COLE and Joint JLaWS products, as well as High Power Microwave (HPM) and EMS Fires data/tool sets. -Support specialized solutions to address operational needs to include direct analytical support to operations, Pk Lookup Tools, CDE analysis and tables, and munitions weaponeering guides. -Continue to execute a multi-year test program to enhance weaponeering/collateral damage estimation in complex environments. -Improve utilization of BDA data to more effectively and efficiently estimate munition expenditure rates and mitigate stockpile stress, while improving CCMDs' force effects. -Continue to maintain and strengthen relationships with the Warfighter, operational users, and coalition partners to establish requirements for current and future products, through forums, training, foreign military sales, and day-to-day operational support. The objective is to provide efficient and effective support to meet CCMD current and future needs for agility and greater lethality in a more dynamic combined operational environment. -Increase efficiency by leveraging ongoing Department efforts and support the Department's intent to complement U.S. interest and capabilities by providing weaponeering, targeting, and collateral damage estimation (prevent civilian casualties) capability to Coalition partners through foreign military sales. - Continue to build and implement the next JTTCG/ME JMEM product lines on a foundation of effects libraries using software frameworks enabling quicker development, flexibility, leveraging, and tailoring. -Study and implement the use of machine learning and data analytics to improve quality of existing solutions, decrease computation time of applications, and answer question previously not possible. 			

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Operational Test and Evaluation, Defense		Date: February 2020	
Appropriation/Budget Activity 0460 / 6	R-1 Program Element (Number/Name) PE 0605131OTE / <i>Live Fire Test and Evaluation (LFT&E)</i>	Project (Number/Name) 000311 / <i>LFT&E</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020
Specifically in FY 2021, JTCG/ME plans to:			
<p>-Sustain and field remaining updates to JWS v2.x product line. FY 2021 efforts will include multiple training and user forums for the fielded product. These forums are pivotal for J-ACE developers to understand requirements and align development efforts.</p> <p>-Delivery of JEL v1.0 (Spiral 1) capabilities to develop/complete JWS v3.x and DIEE initial interfaces. JEL Spiral 1 capabilities include new/updated trajectory modeling, new weapon/targets database designs/data and user interfaces, enhanced structural target response and prediction, personnel vulnerability methods, Application Program Interface (API) to DIEE, JEL processes, JEL model Smart Book, and EF training to solidify institutional EF development knowledge. FY 2021 efforts will include continued development of Spiral 2 capabilities, which include collateral effects radii tables, enhanced collateral damage mitigation, new ground mobile target capability and data, and new infrastructure targets (tunnels).</p> <p>-Support requirements collection by hosting JMEM training sessions, OUWG, and User help desk via the JPIAS. JTCG/ME will support approximately 30 training sessions anticipating about 500 students annually. These training sessions allow users to optimize use of JMEM capabilities, while providing JTCG/ME with critical input for future development. In addition, direct forward support to Combatant Commanders/Task Forces will be provided to enable target materiel development, weaponeering, and CDE solution development. JTCG/ME will collect User requirements and product use cases, to process and codify in capability needs statements used for planning and JMEM product development.</p> <p>-Facilitate coalition interoperability and information exchange forums. JTCG/ME will continue to deliver JWS version releases and standalone Pk Lookup tools to key coalition partners in support of current operations under FMS agreements, as well as migrate to new processes via the JEL/JWS v3.x concept. These FMS deliveries complement U.S. interest and capabilities by providing weaponeering and targeting capability to Coalition partners. JTCG/ME will also continue to hold information exchange forums via multiple IEAs. These exchanges facilitate collaboration on methodologies and efforts of mutual interest in the area of weapons effectiveness/collateral damage estimation.</p> <p>-Develop and enhance processes to supply target vulnerability data, weapons characterization data, weapons effectiveness methodology to operational and acquisition communities. The JTCG/ME develops and improves data and methodology used as tri-service standards. A focus of FY 2021 efforts is to continue to migrate data and methodology utilized through the JEL. JTCG/ME will continue to support and host technical working groups in targets, weapons, and methodology, as forums to share knowledge and build partnerships for greater leveraging, performance, and affordability. Leveraging existing technologies and partnerships have the potential to reduce the number of weapon test articles required and remove labor-intensive activities from weapon testing.</p> <p>-Update and execute strategic roadmaps for underlying vulnerability / lethality models used as standards by the tri-service community to better support JMEMs and LFT&E. These roadmaps align JTCG/ME funded and related tasks by other services and programs to facilitate leveraging. In addition, the roadmaps provide a tool for future investment planning to support modeling / simulation validation and resolution of capability gaps.</p>			

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Operational Test and Evaluation, Defense		Date: February 2020			
Appropriation/Budget Activity 0460 / 6		R-1 Program Element (Number/Name) PE 0605131OTE / Live Fire Test and Evaluation (LFT&E)	Project (Number/Name) 000311 / LFT&E		
B. Accomplishments/Planned Programs (\$ in Millions)			FY 2019	FY 2020	FY 2021
<p>-Develop and accredit CER Reference Tables in accordance with the latest CJCSI 3160.01, “No-Strike and the CDE Methodology” for air-to-surface and surface-to-surface weapons, which are the basic data that support the CDE methodology implemented in DCiDE and DIEE.</p> <p>-Maintain and support fielded DIEE v2.x versions. DIEE is an enterprise targeting solution that provides both seamless planning, linkage to various mission planning systems and tools in operational units. It is a GOTS product for advanced target development that integrates TCM, CDE, Weaponeering, and data basing functions.</p> <p>- Continue to develop future DIEE versions (v2.x/v3.x) with JWS 3.x linkage through the development of API. Focused FY 2021 efforts will continue to maintain/improve connectivity to community tools, implement interface with JEL emerging capabilities, transition battle damage assessment workflow and data capabilities from BDA analytical efforts, and maintain awareness of policy changes to applicable CJCSIs.</p> <p>-Support and deliver analysis packages for collateral damage mitigation, post-forensic, and force protection analyses packages to operational Users for high value targets in current operations. These efforts directly assist Combatant Commands to meet commander’s intent and minimize collateral damage.</p> <p>- Continue the Enhanced Weaponeering and CDE Program, a multi-year test program focused on enhancing and validating JTCG/ME CDE tools. This program will support improvements in weaponeering methodology to minimize risk to mission and risk to forces, while not increasing risk of collateral damage by providing foundational data for the development of higher fidelity predictive tools. Specific efforts will generate buried ordnance characterization data based upon usage statistics from CCMD Expenditure reports, and AOR specific building debris data to enhance and validate current weaponeering/collateral damage estimation methodologies required by Strike Approval Authorities. FY 2021 efforts will leverage seven FY 2020 testing events and multiple collaboration forums. FY 2021 efforts will include approximately four buried ordnance and four building debris characterization tests, as well as analyzing and transitioning data and findings from previous tests to weaponeering and CDE tools.</p> <p>-Continue to implement the BDA of Deliberate and Dynamic Strikes analysis. The effort is a multi-year task to analyze ongoing strikes required to update JMEM capabilities. The overall objective and intent is to ensure effective and efficient munition expenditure rates and mitigate the stockpile stress, while improving CCMDs’ force effects. In essence, improve the warfighter’s ability to get the right weapon on the right target, achieve the desired effect, and minimize collateral damage while optimizing scarce resources. FY 2021 efforts include: continued extraction of new strike data events, further refine strike analysis methodologies to increase automation, further development of new analysis tools obtain end user feedback on new tools / User interfaces, integrate BDA analysis tools with existing JTCG/ME weaponeering applications, and shape BDA reporting standards.</p> <p>-Sustain/support fielded versions of J-ACE, which includes multiple training and user forums for the fielded product. These forums are pivotal for J-ACE developers to understand requirements and align development with other external debrief and analytical capabilities that use J-ACE as the underlying analytical engine to underpin results.</p> <p>-Field final J-ACE v5.x product capabilities, which will include updated weapons and aircraft data in JAAM, new cross platform BROWSE module, which contains descriptive information for each player (weapon, aircraft). In addition, J-ACE v5.4 will include</p>					

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Operational Test and Evaluation, Defense		Date: February 2020	
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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020
<p>a new EM module that simulates terminal effects of the weapon lethality and target vulnerability. The faster EM has improved speed of new fuze model and refined graphic display data generation, and includes more weapon lethality-target vulnerability data sets. Other capabilities will include TSPI file updates and filtering/error identification, aircraft maneuver updates, new input/output control options for a "war room summary sheet, and initial ASW fly out model.</p> <p>-Integration of ACEL v1.0 capabilities in J-ACE v6.0/6.x. FY 2021 efforts will include finishing the review/approval of threshold capabilities, and continued integration and generation of standalone J-ACE application. ACEL v1.0/J-ACE v6.0 threshold capabilities include transitioned v5.x capabilities, unmanned aerial system features, enhanced weapon engagement zone methodology, new graphical displays, refined terrain masking options, and auto-generated test reports for each product player. Other efforts include finishing the development and starting the review/integration of J-ACE v6.0 objective capabilities into ACEL 1.x and J-ACE v6.0 respectfully. These capabilities include enhanced air-to-air missile modeling capability, more ASW fly outs, updated/new surface-to-air models, updated ESAMS capability with more counter measures, and target detection capability leveraging NASIC RF models/data. Begin to integrate longer lead development items into ACEL v1.x for future J-ACE v6.x product to include infrared detection/track, red surface-to-air gun modeling in EM, rotary wing aero performance modeling, and enhanced chaff modeling.</p> <p>- Continue Cyber JMEM development capabilities with continued execution of multiyear plan to develop the COLE tool. FY 2021 efforts will focus on completion of CD 3 that will include automated fusion of multi-domain estimates, correlation of foundational data to support OEM generation, preliminary artificial intelligence-based decision support system, OEM analysis and attack planning support, refined integration with other JTCG/ME toolsets, and quantitative comparisons. Similar to other JMEMs, User feedback is critical. FY 2021 will include multiple OUWGs to review development with operators and preparation for fielding products in future FYs.</p> <p>-Continue to mature DE JMEM capabilities to include High Energy Laser (HEL) and HPM weapons. FY 2021 DE HEL efforts will include continuing HEL lethality testing/target vulnerability analysis/data modeling for verification and validation (V&V) on service-specific target sets, field testing, continuing target vulnerability characterization and modeling to provide inputs to JLaWS tool, and conducting the accreditation of HEL JLaWS tool and collateral risk estimation PRA tool. FY 2021 DE HPM JMEM development efforts will include continuing HPM lethality testing/target vulnerability analysis/data collection for V&V on service-specific target sets, field-testing, target vulnerability characterization and modeling to provide inputs to JMEM models, finalizing HPM tool development, and completing the HPM PRA Tool.</p> <p>-Continue to develop/mature EMS Fires JMEM program and capabilities. FY 2021 efforts will build upon outputs of FY 2020 efforts and include execution of developed long-term strategy. FY 2021 will include efforts along JMEM development lines of effort to include: 1) Users interaction/requirements management, 2) Target vulnerability/threat characterization collection, standardization, and Tri-Service approval, 3) EMS Fire weapon characterization collection, standardization, and Tri-Service approval, 4) Effects Methodology development, standardization, and Tri-Service approval, 5) JMEM development management, integration, data</p>			

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Operational Test and Evaluation, Defense		Date: February 2020	
Appropriation/Budget Activity 0460 / 6	R-1 Program Element (Number/Name) PE 0605131OTE / <i>Live Fire Test and Evaluation (LFT&E)</i>	Project (Number/Name) 000311 / <i>LFT&E</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020
management, Verification, Validation, and Accreditation (VV&A), and external interface, and 6) Lab/field testing to support data/methodology gaps and VV&A.			
<i>FY 2020 to FY 2021 Increase/Decrease Statement:</i> The increase from FY 2020 to FY 2021 of \$1.761 Million is consistent with increases due to Joint Munitions Effectiveness Manuals for Directed Energy and Electromagnetic Spectrum Fires, and inflation.			
Accomplishments/Planned Programs Subtotals		64.332	69.172
C. Other Program Funding Summary (\$ in Millions) N/A			
Remarks			
D. Acquisition Strategy N/A			

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Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Operational Test and Evaluation, Defense	Date: February 2020
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Appropriation/Budget Activity					R-1 Program Element (Number/Name)							
0460: <i>Operational Test and Evaluation, Defense / BA 6: RDT&E Management Support</i>					PE 0605814OTE / <i>Operational Test Activities and Analyses</i>							
COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	66.447	226.984	65.237	39.136	-	39.136	43.526	31.742	33.493	34.800	Continuing	Continuing
000920: OTA&A	66.447	226.984	65.237	39.136	-	39.136	43.526	31.742	33.493	34.800	Continuing	Continuing

A. Mission Description and Budget Item Justification

The Operational Test Activities and Analyses (OTA&A) programs are continuing efforts that provide management and oversight of test and evaluation functions and expertise to the Department of Defense (DoD). The OTA&A programs consist of three activities: Joint Test and Evaluation (JT&E); Threat Systems (TS); and Center for Countermeasures (CCM).

Joint Test and Evaluation projects are test and evaluation activities conducted in a joint military environment that develop process improvements. These multi-Service projects, chartered by the Office of the Secretary of Defense and coordinated with the Joint Staff, appropriate combatant commanders, and the Services, provide non-material solutions that improve: joint interoperability of Service systems, technical and operational concepts, joint operational issues, development and validation of joint test methodologies, and test data for validating models, simulations, and test beds. New projects are also encouraged to align their efforts to supporting the 2018 National Defense Strategy. The JT&E projects address relevant joint war fighting issues in a joint test and evaluation environment by developing and providing new tactics, techniques, and procedures to improve joint capabilities and methodologies.

Threat Systems, based on a memorandum of agreement between the Director, Operational Test and Evaluation (DOT&E) and the Defense Intelligence Agency, provides DOT&E support in the areas of threat resource analysis, intelligence support and threat systems investments. As DOT&E's agent, Threat Systems provides threat resource analyses on the availability, capabilities and limitations of threat representations (threat simulators, targets, models, U.S. surrogates, and foreign materiel) and analysis of test resources used for operational testing to support DOT&E's assessment of the adequacy of testing for those programs designated for oversight by DOT&E and the Office of the Under Secretary of Defense Acquisition and Sustainment (OUSD (A&S)). Threat Systems provides DOT&E action officers and other DOT&E activities with program specific threat intelligence support. Threat Systems also funds management, oversight, and the actual development of common-use threat specifications for threat simulators, threat representative targets, and digital threat models used for test and evaluation.

The Center, a Joint Service Countermeasure (CM) Test & Evaluation (T&E) Activity, directs, coordinates, supports, and conducts independent countermeasure/counter-countermeasure (CCM) T&E activities of U.S. and foreign weapon systems, subsystems, sensors, and related components. The Center accomplishes this work in support of DOT&E, Deputy Assistant Secretary of Defense (DASD) for Developmental Test and Evaluation (DT&E), weapon system developers, and the Services. The Center's testing and analyses directly supports operational effectiveness and suitability evaluations of CM/CCM systems, such as missile warning and aircraft survivability equipment (ASE), used on rotary-wing and fixed-wing aircraft. The Center develops unique CM/CCM test equipment to support testing in operationally realistic environments. The Center determines the effectiveness of precision-guided weapon (PGW) systems and subsystems when operating in an environment degraded by CMs. Analysis and recommendations on CM/CCM effectiveness are provided to Service Program Offices, DOT&E, DASD (DT&E), and the Services. The Center also supports Service member exercises, training, and pre-deployment activities with expertise on CM/CCM technology and capabilities.

This Program Element includes funds to obtain Federally Funded Research and Development support and travel funds.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Operational Test and Evaluation, Defense	Date: February 2020
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Appropriation/Budget Activity 0460: <i>Operational Test and Evaluation, Defense I BA 6: RDT&E Management Support</i>	R-1 Program Element (Number/Name) PE 0605814OTE / <i>Operational Test Activities and Analyses</i>
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B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	66.984	58.737	57.896	-	57.896
Current President's Budget	226.984	65.237	39.136	-	39.136
Total Adjustments	160.000	6.500	-18.760	-	-18.760
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	160.000	6.500			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Due to the Defense-wide Review (DWR), the Joint Test and Evaluation Program (JT&E) was divested	-	-	-26.800	-	-26.800
• Additional Funding for Test and Evaluation for Directed Energy Weapons	-	-	8.040	-	8.040

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

Project: 000920: OTA&A

Congressional Add: *Program Increase for T&E Infrastructure*
 Congressional Add: *Advanced Satellite Navigation Receiver*
 Congressional Add: *Cyber talent recruitment initiative*

Congressional Add Subtotals for Project: 000920

Congressional Add Totals for all Projects

FY 2019	FY 2020
150.000	-
10.000	5.000
-	1.500
160.000	6.500
160.000	6.500

Change Summary Explanation

FY 2019 Congressional add for Test and Evaluation Infrastructure +150M
 FY 2019 Congressional add for Advanced Satellite Navigation Receiver +\$10M
 FY 2020 Congressional add for Advanced Satellite Navigation Receiver +\$5M
 FY 2020 Congressional add for Cyber Talent Recruitment Initiative +\$1.5M
 FY 2021 Due to the Defense-wide Review (DWR), the Joint Test and Evaluation Program (JT&E) was divested
 FY 2021 Additional Funding for Test and Evaluation for Directed Energy Weapons

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Operational Test and Evaluation, Defense										Date: February 2020		
Appropriation/Budget Activity 0460 / 6					R-1 Program Element (Number/Name) PE 0605814OTE / <i>Operational Test Activities and Analyses</i>				Project (Number/Name) 000920 / OTA&A			
COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
000920: OTA&A	66.447	226.984	65.237	39.136	-	39.136	43.526	31.742	33.493	34.800	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		
A. Mission Description and Budget Item Justification												
The Operational Test Activities and Analyses (OTA&A) programs are continuing efforts that provide management and oversight of test and evaluation functions and expertise to the Department of Defense (DoD). The OTA&A programs consist of three activities: Joint Test and Evaluation (JT&E); Threat Systems (TS); and, the Center for Countermeasures (CCM).												
B. Accomplishments/Planned Programs (\$ in Millions)									FY 2019	FY 2020	FY 2021	
Title: Operational Test Activities and Analyses									66.984	58.737	39.136	
FY 2020 Plans: Joint Test and Evaluation (JT&E) As a result of the Defense-Wide Review (DWR), the JT&E Program will be divested by the end of FY 2020. JT&E plans to complete test projects scheduled for completion in FY 2020 and conduct early close-down of remaining projects providing interim products to the warfighting customer. JT&E will completely shut down the program by closing facilities, terminating contracts, transitioning government personnel to new jobs in the DoD, and terminating all service Memorandums of Agreement (MOAs)/ Memorandums of Understanding (MOUs), and all support contracts. JT&E will complete or close down four Joint Test, seven Quick Reaction Tests, and one Special Project. The four Joint Tests are: Joint Laser Systems Effectiveness, Multi-Domain Unified Situational Awareness, Joint – Hypersonic Strike Planning, Execution, Command and Control, and Joint Interoperability through Data Centricity. The seven Quick Reaction Tests are: Joint Chemical Biological Radiological Nuclear (CBRN) Tactical Information Management, Joint Enterprise Data Interoperability, Joint Aviation Multi-Ship Integrated Air Defense System (IADS) Survivability Validation, Situational Positioning of LD2 Intelligence, Surveillance and Reconnaissance (ISR) - CONOPS Evolution, Joint Military Application of the Space Environment, Integration of small Unmanned Aircraft Systems into Joint Airspace, and Joint/Interagency - Ground Air Transponder Operational Risk Reduction. The Special Project is Joint Alerting for Survivability and Endurability. Threat Systems												

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Operational Test and Evaluation, Defense		Date: February 2020	
Appropriation/Budget Activity 0460 / 6	R-1 Program Element (Number/Name) PE 0605814OTE / <i>Operational Test Activities and Analyses</i>	Project (Number/Name) 000920 / OTA&A	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020
<p>In FY 2020, Threat Systems will continue test planning working group participation and perform technical analyses to identify threat shortfalls; aligns with the National Defense Strategy (NDS) requirements; conduct special studies and provide current intelligence support tailored to specific U.S. weapon systems acquisitions based on the availability of funding. Threat Systems will:</p> <ul style="list-style-type: none"> - Continue to support the reduction in acquisition and test timelines while increasing test capabilities against near-peer threats. - Increase understanding of near-peer threats (to include cyber) via testing with artificial intelligence (AI), machine learning (ML), and neural networks. - Continue development of an Advanced Satellite Navigation Receiver (ASNR) for an open service Global Positioning System / Inertial Measurement Unit (GPS/IMU) coupled high-fidelity, high dynamic next generation Time Space Position Information (TSPI) system to support future missile tests and Joint Standard Instrumentation Suite (JSIS) flight testing. - Continue to support the US warfighter by providing threat intelligence relevant to emerging threats such as artificial intelligence autonomy, robotics, directed energy, hypersonic and biotechnology to ensure operational and developmental testing occurs against realistic threat representations, including (but not limited to) threats from both revisionist powers such as China and Russia, threats from rogue regimes such as North Korea and Iran, and threats from non-state actors. - Continue to support initiatives for the development of near-peer threat representative jammers, for use in terrain constricted tests as a directional active electronically steered array jammer that will limit Federal Aviation Administration and other common jammer restrictions. - Continue initiatives to improve satellite and space threat representations. - Continue to sustain and manage threat modelling and simulation (M&S) to support test and evaluation by overseeing and coordinating intelligence community developed threat models, performing threat model anomaly resolution resolving differences from live fire testing, integrating threat models into T&E facilities and distributing performance and signature models to T&E users. - Continue to represent DOT&E at foreign material exchanges, inter-agency coordinating groups, and non-proliferation groups to raise awareness of T&E needs for foreign materiel, coordinate service requirements, and de-conflict and prioritize foreign materiel requirements for T&E. - Continue to provide intelligence support to DOT&E staff to address specific questions on threat systems affecting programs on the OSD T&E Oversight list and provide briefings and special intelligence reports when necessary. - Continue to conduct threat intelligence investigations that support use of innovative technologies in the areas of artificial intelligence (AI), autonomy, robotics, machine learning (ML), quantum computing, lasers, nanotechnology, chemical and biological, directed energy, hypersonic and biotechnology being developed by nation states to improve threat representation in the contested domain of air, land, sea, space and cyberspace. - Continue identifying initiatives to improve cyberspace threat representation and prediction, cyber-economic threats to DoD systems, and scalable cyberspace threat test environments that can interface with cyber test networks. - Continue identifying initiatives to conduct offensive cyber operations (OCO) and defensive cyber operations (DCO) without significantly impacting critical operational capabilities. 			

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Operational Test and Evaluation, Defense		Date: February 2020	
Appropriation/Budget Activity 0460 / 6	R-1 Program Element (Number/Name) PE 0605814OTE / <i>Operational Test Activities and Analyses</i>	Project (Number/Name) 000920 / OTA&A	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020
<ul style="list-style-type: none"> - Continue providing DOT&E representative support at the Threat Steering Group (TSG) in the transitioning of the System Threat Assessment Reports (STARS) to the new Validated Online Lifecycle Threat (VOLT) Report process. - Continue to represent DOT&E interests on Intelligence Acquisition Agility Working Group (IAAWG) and Executive Steering Group (ESG) and provide access to the Intelligence Mission Data Management Analysis & Reporting System (IMARS). - Manage Integrated Technical Evaluation and Analysis of Multiple Sources (ITEAMS) efforts supporting programs on the OSD Oversight T&E List by conducting intelligence “deep dives” to produce intelligence in sufficient detail to develop new threat test assets. - Review validation reports to independently ensure the correct threat data and critical parameters are presented in the report to assess the threat representations’ capabilities to replicate a real world threat system. - Represent DOT&E at the Intelligence Mission Data Oversight Board responsible for development, production and sharing issues affecting the intelligence data supporting weapons systems acquisition. - Oversee legacy DOT&E investments and continue management and oversight of legacy and new Test Resource Management Center-funded threat system investments. - Continue ITEAMS efforts leading to the development of new threat systems for T&E. - Continue reviewing Services’ Threat Systems investments to prevent any duplication of effort and encourage cost savings by the sharing or multi-service use of newly developed threat representations to T&E. - Continue to foster rapid technological advancements in the areas of threat representation for T&E and threat test resources by incorporating innovative technologies from the intelligence community into threat test assets to provide improved test fidelity and performance at lower cost. <p>Threat Systems will continue its efforts to continually improve the standards set of threat performance models as the global threat environment evolves. With adequate funding, these activities help DOT&E carry out its Title 10 responsibilities to assess test adequacy and determine whether testing is realistic and suitable, promotes common solutions to Service threat representation needs and ultimately supports the warfighter.</p> <p>The Center</p> <p>The Center will test, analyze, and report on more than 30 systems/platforms. Testing will focus on directed energy weapon systems, counter-unmanned aerial systems (CUAS), aircraft survivability equipment (with a focus on Joint Urgent Operational Need (JUON) and Urgent Universal Need Statement (UUNS) programs), and pre-deployment warfighter training exercises. High priority programs will receive an independent assessment of our data/findings for CM/CCM evaluations. Our support will be distributed across all the Services, as well as intelligence agencies and research and development activities. These activities will help to enhance and support the survivability of equipment, aircraft and personnel.</p>			

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Operational Test and Evaluation, Defense		Date: February 2020	
Appropriation/Budget Activity 0460 / 6	R-1 Program Element (Number/Name) PE 0605814OTE / <i>Operational Test Activities and Analyses</i>	Project (Number/Name) 000920 / OTA&A	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020
<p>The Center will build upon improvement and modernization efforts from FY 2019 to improve T&E capabilities. Specifically, the missile plume simulator smart emitter upgrades are expected to be completed by the end of FY 2020. The implementation of JSIS Full Operational Capability (FOC) will add signature instrumentation focused on emerging programs, additional instrumentation to support data collection for multiple, concurrent events, instrumentation to support static live fire events, and full trajectory coverage for missile attitude related data collection. The Center will continue its involvement in the Directed Energy (DE) community as an active participant in the DE Instrumentation Initiative review panel. The Center will also lead the development of the High Energy Laser Remote Target Scoring (HRTS) project and partner with other T&E investment programs.</p> <p>The Center will continue to support international T&E collaborative efforts. In addition, the Center will continue support of domestic panels, committees and working groups.</p> <p>FY 2021 Plans:</p> <p>Threat Systems</p> <p>In FY 2021, Threat Systems will continue test planning working group participation and perform technical analyses to identify threat shortfalls; aligns with the National Defense Strategy (NDS) requirements; conduct special studies and provide current intelligence support tailored to specific U.S. weapon systems acquisitions based on the availability of funding. Threat Systems will:</p> <ul style="list-style-type: none"> - Continue to support the reduction in acquisition and test timelines while increasing test capabilities against near-peer threats. - Continue to understand and address near-peer threats (to include cyber) via testing with artificial intelligence (AI), machine learning (ML), and neural networks. - Complete development of an Advanced Satellite Navigation Receiver (ASNR) for an open service Global Positioning System / Inertial Measurement Unit (GPS/IMU) coupled high-fidelity, high dynamic next generation Time Space Position Information (TSPI) system to support future missile tests and Joint Standard Instrumentation Suite (JSIS) flight testing. - Continue to support the US warfighter by providing threat intelligence relevant to emerging threats such as artificial intelligence, autonomy, robotics, directed energy, hypersonic and biotechnology to ensure operational and developmental testing occurs against realistic threat representations, including (but not limited to) threats from both revisionist powers such as China and Russia, threats from rogue regimes such as North Korea and Iran, and threats from non-state actors. - Continue to support initiatives for the development of near-peer threat representative jammers, for use in terrain constricted tests as a directional active electronically steered array jammer that will limit Federal Aviation Administration and other common jammer restrictions. - Continue initiatives to improve satellite and space threat representations. - Continue to sustain and manage threat M&S to support test and evaluation by overseeing and coordinating intelligence community developed threat models, performing threat model anomaly resolution resolving differences from live fire testing, integrating threat models into T&E facilities and distributing performance and signature models to T&E users. 			

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020
<ul style="list-style-type: none"> - Continue to represent DOT&E at foreign material exchanges, inter-agency coordinating groups, and non-proliferation groups to raise awareness of T&E needs for foreign materiel, coordinate service requirements, and de-conflict and prioritize foreign materiel requirements for T&E. - Continue to provide intelligence support to DOT&E staff to address specific questions on threat systems affecting programs on the OSD T&E Oversight list and provide briefings and special intelligence reports when necessary. - Continue to conduct threat intelligence investigations that support use of innovative technologies in the areas of artificial intelligence (AI), autonomy, robotics, machine learning (ML), quantum computing, lasers, nanotechnology, chemical and biological, directed energy, hypersonic and biotechnology being developed by nation states to improve threat representation in the contested domain of air, land, sea, space and cyberspace. - Continue identifying initiatives to improve cyberspace threat representation and prediction, cyber-economic threats to DoD systems, and scalable cyberspace threat test environments that can interface with cyber test networks. - Continue identifying initiatives to conduct offensive cyber operations (OCO) and defensive cyber operations (DCO) without significantly impacting critical operational capabilities. - Continue providing DOT&E representative support at the Threat Steering Group (TSG) in the transitioning of the System Threat Assessment Reports (STARS) to the new Validated Online Lifecycle Threat (VOLT) Report process. - Continue to represent DOT&E interests on the Intelligence Acquisition Agility Working Group (IAAWG) and Executive Steering Group (ESG) and provide access to the Intelligence Mission Data Management Analysis & Reporting System (IMARS). - Continue to manage Integrated Technical Evaluation and Analysis of Multiple Sources (ITEAMS) efforts supporting programs on the OSD Oversight T&E List by conducting intelligence “deep dives” to produce intelligence in sufficient detail to develop new threat test assets. - Continue to review validation reports to independently ensure the correct threat data and critical parameters are presented in the report to assess the threat representations’ capabilities to replicate a real world threat system. - Continue to represent DOT&E at the Intelligence Mission Data Oversight Board responsible for development, production and sharing issues affecting the intelligence data supporting weapons systems acquisition. - Oversee legacy DOT&E investments and continue management and oversight of legacy and new Test Resource Management Center-funded threat system investments. - Continue ITEAMS efforts leading to the development of new threat systems for T&E. - Continue reviewing Services’ Threat Systems investments to prevent any duplication of effort and encourage cost savings by the sharing or multi-service use of newly developed threat representations to T&E. - Continue to foster rapid technological advancements in the areas of threat representation for T&E and threat test resources by incorporating innovative technologies from the intelligence community into threat test assets to provide improved test fidelity and performance at lower cost <p>Threat Systems will continue its efforts to continually improve the standards set of threat performance models as the global threat environment evolves. With adequate funding, these activities help DOT&E carry out its Title 10 responsibilities to assess test</p>			

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020
adequacy and determine whether testing is realistic and suitable, promotes common solutions to Service threat representation needs and ultimately supports the warfighter.			
<p>The Center</p> <p>The Center will continue to emphasize support of the DOT&E enterprise, with a clear focus on Title 10 oversight programs, DE, CUAS, aircraft survivability, and warfighter training events. The Center expects to increase focus on Directed Energy Weapons and other critical technology areas, which will contribute to the testing of future weapons and the understanding of emerging threats. The Center's ability to provide unique test equipment and expertise will remain a benefit to all Services, and the ongoing Improvement and Modernization plans will ensure test capabilities are provided at a cost savings across the DoD. Additional instrumentation, personnel, and training will be key to ensuring our ongoing test support continues to add significance in emerging technology areas.</p> <p>In FY 2021 The Center will build critical test and evaluation capabilities and the workforce necessary to evaluate emerging Directed Energy Weapon (DEW) war fighting technologies. This includes mobile, open-air DEW data collection and analysis capabilities that will support the test & evaluation (T&E) of the rapid prototyping and fielding needs of these systems. The mobile test capability will allow T&E of operational representative test scenarios in an open air environment to support the accelerated development and fielding of DEW within the DoD.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement:</p> <p>The decrease from FY 2020 to FY 2021 of -\$19.601 Million is consistent with the divestment of the JT&E program due to the Defense-Wide review (DWR) and the addition of funds for Test and Evaluation of Directed Energy Weapons</p>			
Accomplishments/Planned Programs Subtotals		66.984	58.737
		FY 2019	FY 2020
Congressional Add: Program Increase for T&E Infrastructure		150.000	-
FY 2019 Accomplishments: DOT&E is developing critical test capabilities needed to test hypersonics, directed energy, advanced computing/big data analytics, artificial intelligence/machine learning, and autonomy/robotics.			
Congressional Add: Advanced Satellite Navigation Receiver		10.000	5.000
FY 2019 Accomplishments: DOT&E is developing the preliminary design of 6 Degrees of Freedom Time Space Position Information (TSPI) Advanced Satellite Navigation Receiver (ASNR) for dynamic TSPI collection by DOT&E labs, facilities, ranges, and partners including "Five Eyes" (FVEY) and North American Treaty Organization (NATO) partners. In FY 2019, the team initiated development of the advanced Global Navigation Satellite System (GNSS) receiver, developed solver, validation, and estimation models, issued requests for			

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	FY 2019	FY 2020
acquisition of multi-axis rate table and GNSS Global Positioning System (GPS) Simulator, issued the tech package to antenna manufacturer, and presented the project to NATO for partner input. FY 2020 Plans: In FY 2020 DOT&E is developing the Advanced Satellite Navigation Receiver System-level Telemetry Kit with development and prototyping of GNSS/GPS sensor and Inertial Measurement Unit (IMU) sensor. DOT&E will also design and develop the Ground Control System to include post-processing hardware and software development of post-processing applications and refinement and integration of models. Finally, DOT&E will resolve issues with encryption requirements (desired for NSA implementation on US and NATO ranges).		
Congressional Add: Cyber talent recruitment initiative FY 2020 Plans: In FY 2020, DOT&E will implement a pilot program to provide scholarships through qualified institutions of higher education, including community colleges, to students who are enrolled in programs that lead to degrees or specialized program certifications in the cybersecurity field that support Department of Defense requirements.	-	1.500
Congressional Adds Subtotals	160.000	6.500

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

Remarks

D. Acquisition Strategy
 N/A

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