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**Exhibit R-2, RDT&E Budget Item Justification:** PB 2023 Operational Test and Evaluation, Defense **Date:** April 2022

<b>Appropriation/Budget Activity</b> 0460: <i>Operational Test and Evaluation, Defense</i> / BA 6: <i>RDT&amp;E Management Support</i>	<b>R-1 Program Element (Number/Name)</b> PE 0605131OTE / <i>Live Fire Test and Evaluation (LFT&amp;E)</i>
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COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
Total Program Element	69.172	74.048	103.549	99.947	-	99.947	101.661	105.669	103.747	101.949	Continuing	Continuing
000311: <i>LFT&amp;E</i>	69.172	74.048	103.549	99.947	-	99.947	101.661	105.669	103.747	101.949	Continuing	Continuing

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

This Program Element consists of three programs: Joint Live Fire (JLF), Joint Aircraft Survivability Program (JASP), and Joint Technical Coordinating Group for Munitions Effectiveness (JTTCG/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 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 supports DoD's Joint Live Fire (JLF) Program. 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.

JASP is the DOD's focal point for joint service enhancement of military aircraft non-nuclear survivability. The JASP is chartered by the Commander of the U.S. Navy Naval Air Systems Command, the U.S. Assistant Secretary of the Army (Acquisition Logistics and Technology), and the Commander of the U.S. Air Force 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, 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).

JTTCG/ME was chartered over 50 years ago to serve as DOD's focal point for munitions effectiveness information. The JTTCG/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 weaponing and collateral damage estimation (CDE) calls in direct support of operations, mission planning, and training; by the DoD, Joint, and Service planners in force-on-force M&S, mission area analysis, requirements studies, and weapon procurement planning; and by the service acquisition community

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in performance assessment, analysis of alternatives, and survivability enhancement 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 DOD efforts and supporting the DOD'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 (i.e. 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, strengthened 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 LFT&E tasks, as well as travel funds to carry out the LFT&E, JASP, and JTCG/ME programs.

<b>B. Program Change Summary (\$ in Millions)</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023 Base</b>	<b>FY 2023 OCO</b>	<b>FY 2023 Total</b>
Previous President's Budget	74.048	68.549	0.000	-	0.000
Current President's Budget	74.048	103.549	99.947	-	99.947
Total Adjustments	0.000	35.000	99.947	-	99.947
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	35.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Year	-	-	99.947	-	99.947

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

**Project:** 000311: *LFT&E*

Congressional Add: *Program Increase: Lab and Test Range Upgrades*

Congressional Add Subtotals for Project: 000311

Congressional Add Totals for all Projects

	<b>FY 2021</b>	<b>FY 2022</b>
	-	35.000
	-	35.000
	-	35.000

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**Exhibit R-2, RDT&E Budget Item Justification:** PB 2023 Operational Test and Evaluation, Defense **Date:** April 2022

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**Change Summary Explanation**

FY 2023 funding increase reflects the fact that the FY 2022 President's Budget request did not include out-year funding.

FY 2023 Weaponeering Tools to Support Strikes in a Contested Maritime Environment Increase:

The Weaponeering Tools to Support Strikes in a Contested Maritime Environment initiative will enable the ability to bring Joint Fires to bear in a maritime action by providing a joint-service approved, scene-based Maritime Operational Weaponeering Tool that can assess weapons effects and optimize weapon allocation. Funding will be used to achieve the following: (1) Development of appropriate weaponeering prediction models (JMEmS for maritime threats), (2) Delivery of critical data to improve lethal effect estimate methodologies, (3) Development of target geometry models for prioritized surface and subsurface maritime targets, (4) Development of weaponeering-level, engineering-level, collateral damage estimation, and predictive battle damage assessment methodologies required by Strike Approval Authorities to make their strike decision calls, and (5) Improvement of supporting engineering models to analyze weapon effectiveness, weapon characteristics, delivery accuracy, reliability, and target vulnerabilities.

This initiative will increase force-wide lethality by providing Combatant Commanders with improved capability to plan and execute missions in a contested maritime environment. It will deliver a weaponeering tool capable of timely and accurate estimates with current and future kinetic/non-kinetic weapons and the required aimpoints to achieve the desired lethal effect against maritime targets (surface and subsurface). More specifically, this enhancement will enable the development of data and analytics based operational tools significantly improving the ability to prosecute high value maritime targets in the INDOPACOM, CENTCOM and EUCOM AORs, while producing salvo tables that will reduce over-allocation of ordnance in an already low-density, high-demand environment.

FY 2023 Joint Targeting Intelligence (JTI) Increase:

JTCG/ME funding will support investment in Joint Targeting Intelligence (JTI) modernization. JTI is the Joint Staff J2's portion of the Joint Targeting Cycle that selects, analyzes, and prioritizes targets and then assesses the results of the application of military force. JTI drives the operations process of linking desired effects to tasks in order to meet the Commander's objectives. This initiative will align the doctrine/ modernize the architecture that governs targeting with the tools that are used for weaponeering, collateral damage estimation, combat assessment, and munitions effectiveness assessment across the CCMDs and Services.

JTI Requirements Definition Package includes 25 requirements for the targeting enterprise to be addressed by selected targeting tools (i.e. Digital Imagery Exploitation Engine (DIEE)/JMEmS Weaponeering System (JWS), Joint Targeting Toolbox (JTT), Modernized Integrated Database (MIDB), and Integrated Munitions Effects Assessment (IMEA)).

JTCG/ME, in coordination with Joint Staff J2 and OUSD (I&S), will evolve DIEE/JWS and the DOD's battle damage assessment repository to meet the emerging requirements of the JTI (e.g., Common Data Models in data centric environment), with the goal of providing capabilities to the targeting enterprise that evolve with current technological demands.

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Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

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

	FY 2021	FY 2022	FY 2023
<p><b>Title:</b> Live Fire Test and Evaluation</p> <p><b>Description:</b> LFT&amp;E of Major DOD Acquisition Programs The FY 2022 budget will enable DOT&amp;E to assess the adequacy of LFT&amp;E strategies/plans and generate new LFT&amp;E policies to support systems' acquisitions and rapid fielding. The FY 2022 budget will ensure adequate execution of the agreed upon LFT&amp;E plans and subsequent ability to conduct independent analysis of survivability and lethality test and M&amp;S data in support of OSD LFT&amp;E reports to Congress.</p> <p><b>FY 2022 Plans:</b> JLF The FY 2022 JLF budget will support multiple projects as a culmination of continuing 11 projects from previous FYs and 5 new projects. Project objectives will align with DOT&amp;E's Science &amp; Technology Strategic Plan, National Defense Strategy objectives and SECDEF priorities. The FY 2022 program will represent technical areas of warhead lethality, hypersonics, cyber threat discovery, active protection system methodology, mission-based T&amp;E analysis, data analytics, maritime modeling &amp; simulation (M&amp;S) enhancements, and M&amp;S Enhancements for Improved T&amp;E.</p> <p>Warhead Lethality In FY 2022, 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>	74.048	68.549	99.947

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<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023</b>
<p>- For example, one effort will continue to update the weaponeering methods needed to estimate effects used in low-collateral-damage munitions such as BLU-129/B to combine very low collateral damage with increased nearfield lethality on a target.</p> <p>- Another effort continues to align the DOD, Department of Energy, and industry experts to improve pedigree of weapons data, provide uncertainty quantification for M&amp;S validation, demonstrate operational and warfighter support for credible weapon effects, and enhance LFT&amp;E by accelerating weapon development timelines and reducing cost.</p> <p>- JLF will continue to address T&amp;E shortfalls needed to adequately evaluate emerging hypersonic weapons by enabling optical characterization of fragment dispersion in flight tests.</p> <p>Cyber Threat Discovery</p> <p>- JLF will continue to develop and optimize machine learning and M&amp;S tools to improve the ability to identify, quantify, and project DOD system vulnerabilities to cyber effects.</p> <p>Active Protection System Methodology</p> <p>- JLF will continue to enhance an M&amp;S capability that will enable efficient evaluation of active protection systems integrated with ground combat vehicles.</p> <p>Mission-based T&amp;E Analysis</p> <p>- JLF will continue to demonstrate applicability of capability-based analysis with System-Theoretic Process Analysis (STPA) techniques, to optimization of LFT&amp;E.</p> <p>Data Analytics</p> <p>In coordination with established service activities, JLF will continue to refine courses of action for consolidating available and future LFT&amp;E data in support of a range of data mining and data analytics intended to more effectively inform requirements, performance evaluations, and development of evaluation/test tools.</p> <p>Maritime M&amp;S Enhancements</p> <p>- JLF will continue to consolidate ongoing efforts to expedite the development and fielding of credible tools needed to evaluate ship vulnerabilities to kinetic threat engagements while also enabling operational users to accurately and timely plan strike missions against adversary surface ships.</p> <p>- JLF will continue the development and plans for execution of a Maritime Survivability and Lethality Test Program (MSLTP) Multi-year Program Plan that will pursue a cohesive, enterprise-wide strategy that seeks to improve efficiency, collaboration, knowledge</p>			

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

	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023</b>
<p>sharing, and analytical techniques across maritime organizations. The program will identify knowledge gaps, plan collaborative test programs that procure data to fill those gaps, share data among stakeholders, and improve current analytical tools and methods to make assessments going forward. This effort is directly linked to JTCG/ME’s “Weaponeeing Tools to Support Strikes in a Contested Maritime Environment”.</p> <p>M&amp;S Enhancements for Improved T&amp;E JLF efforts will also continue to leverage new technologies and test methods to improve space launch vehicle evaluation efficiency and credibility.</p> <p>- For example JLF will continue to evaluate cost effective data from small-scale testing for blast model validation (JWS and other DoD lethality models) and uncertainty quantification that provides higher confidence levels for weaponeeing and mission-planning.</p> <p>JLF will continue to focus on the application of scientific methods to standardize efficient validation, verification, and accreditation processes for LFT&amp;E/Joint Munition Effectiveness Manuals (JMEM) M&amp;S tools to accurately outline M&amp;S capabilities, limitations, uncertainty quantification, and statistical confidence in predicted outcomes.</p> <p>JLF will also continue to lead innovation in LFT&amp;E methods to increase efficiency and support rapid fielding.</p> <p>JASP In FY 2022 the JASP will continue work on 30 multi-year RDT&amp;E projects approved by the JASP PMSG and OSD/DOT&amp;E. The JASP will support the National Defense Strategy objective to ‘Build a More Lethal Force’ by developing measures to improve threat situational awareness, defeat near-peer adversary radio frequency and infrared guided threats, and provide quantifiable improvements in digital and hardware-in-the-loop M&amp;S capability and credibility. JASP analysis will improve aircraft force protection by advancing system hardening against kinetic and non-kinetic threats.</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 CCMDs 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 PMSG and OSD/DOT&amp;E.</p> <p>JTCG/ME</p>			

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

	FY 2021	FY 2022	FY 2023
<p>- Deliver JMEM Weaponeering System (JWS) v2.4.1 to the field. Key updates include: PC Effects, Linear Target Model, Tasked Target Text Data (T3D) v8.0.5 and weapons data. Continue to develop JWS v3.0 Technical Previews 8, 9, and 10 which use the Model-View-ViewModel (MVVM) software architecture in scene-based environment. The new JWS v3.0 design will allow a Digital Imagery Exploitation Engine (DIEE) Application Programming Interface (API) to call directly into the calculations engine to support Advanced Target Development (ATD)/Weaponeering functions at CCMD level. Key updates include: JWS Agile Development Support, EndGame Framework (EF) Maintenance &amp; Support, Weapon data, Delivery Accuracy data, User Interface (UI)/User Experience (UX), Structural Target Response (i.e. SBEDS and WinBlast), Materiel Target Response, Personnel Target Response, Trajectory updates and Maritime Target Response.</p> <p>- Deliver Joint Effects Library (JEL) capabilities to develop and complete JWS/DIEE v3.0 weaponeering capabilities. JEL capabilities include new and updated trajectory modeling, new weapons and targets database designs and user interfaces, enhanced structural target response and prediction, personnel and ground mobile vulnerability methods, and JEL model Smart Book. FY 2022 efforts will include continued development of capabilities, which include collateral effects radii tables, enhanced collateral damage mitigation, new ground mobile target capability and data, and new infrastructure targets (tunnels and bridges).</p> <p>- Support requirements collection by hosting JMEM training sessions, Operational Users Working Groups (OUWG), and user help desk via the Joint Product Information Access System (JPIAS). JTTCG/ME will support approximately 30 training sessions anticipating about 300 students annually. These training sessions allow users to optimize use of JMEM capabilities, while providing JTTCG/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. JTTCG/ME will collect user requirements and product use cases, to process and codify in capability needs statements used for planning and JMEM product development. Additionally, in FY 2022, JTTCG/ME will deliver the new requirement management tool that will: track requirements' from development and through life-cycle completion; provide context to leadership, analysts, and developers without breaking flow; and align requirements activities with current DevSecOps guidance.</p> <p>- Facilitate coalition interoperability and information exchange forums. JTTCG/ME will continue to support/deliver JWS version releases (ROK JWS, JWS v2.4.1 for ACGU) and standalone Probability of Kill Lookup tools to multiple key coalition partners in support of current operations under Foreign Military Sales (FMS) agreements, as well as migrate to new processes via the JEL/ JWS v3.x concept. JTTCG/ME is supporting a new JWS FMS case for the U.K. These FMS deliveries complement U.S. interest and capabilities by providing weaponeering and targeting capability to Coalition partners.</p> <p>- Continue to hold information exchange forums under International Energy Agency agreements (i.e. US-UK IEA 1858 and US-ROK IEA 0585). Transition to new US-UK IEA 0864 with new expanded scope. These exchanges facilitate collaboration on</p>			

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<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023</b>
<p>methodologies and efforts of mutual interest in the area of weapons effectiveness/collateral damage estimation for both kinetic and non-kinetic weapons.</p> <ul style="list-style-type: none"> <li>- Develop and fully exercise the Joint Analysis Repository and Visual Interface System (JARVIS) and JEL 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 2022 efforts is to continue to migrate data and methodology utilized through the JARVIS and the JEL. In addition, release AJEM v4.22.1, AJEM EF Modules, Target Surrogation Recommendations, Orca Extra Large Unmanned Undersea Vehicle updates, and Fast Air Target Engagement Penetration updates.</li> <li>- JTCG/ME will continue to support and host technical working groups on 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.</li> <li>- Update and execute strategic roadmaps for underlying vulnerability/lethality models used as standards by the tri-service community to better support JMEMs and DOT&amp;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 M&amp;S validation and resolution of capability gaps.</li> <li>- Develop, field, and maintain/support DIEE v2.3.1 and v3.0 versions. DIEE v2.3.1 updates include: Risk Estimate Distances (RED) table updates, Tasked Target Text Data (T3D) updates, Modernized Integrated Database (MIDB) Plugin enhancements, Integrated Munitions Effects Assessment (IMEA) Connect, Geospatially Enabled Targeting Materials (GETM) Write and Mensuration Services Program (MSP) 1.6.4/CGS 2.3.8.1. Continue to evolve DIEE as an enterprise targeting solution that provides both seamless planning, linkage to various mission planning systems and tools in operational units.</li> <li>- Continue to develop future DIEE version v3.x with JWS 3.x capabilities plugin/API development. Focused FY 2022 efforts will continue to maintain/improve connectivity to community tools, implement interface with JEL, IMEA, and Collateral Effects Library (CEL) emerging capabilities. In addition, establish connectivity with Android, Variable Message Format (VMF) in support of Dynamic Operations, transition battle damage assessment workflow/data capabilities from BDA analytical efforts, maintain awareness of policy changes to applicable CJCSIs, conversion to Windows Presentation Foundation (WPF), modernize look &amp; feel, integration with JWS v3.0, native 3D viewer (i.e. Generic Point Cloud Model (GPM) data, draw objects, pan/zoom/rotate, render aimpoints &amp; CDE rings), 2D viewer updates (i.e. shadows &amp; highlights), BDA STARLORD interface development and service-oriented architecture (SOA) improvements. The new JWS v3.0 plugin/API design allows DIEE to call directly into the tri-</li> </ul>			

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

	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023</b>
<p>service approved weaponeering calculations engine to support full ATD functions (i.e. Weaponeering, CDE, TCM) at CCMD level, as well as supporting separate weaponeering analysis for Services and planners all in one product.</p> <p>- Develop and accredit Collateral Effects Radii (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 DIEE.</p> <p>- Continue to support and deliver reachback 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 and CDE 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 area of responsibility specific building debris data to enhance and validate current weaponeering/collateral damage estimation methodologies required by Strike Approval Authorities. FY 2022 efforts will leverage seven FY 2021 testing events and multiple collaboration forums. FY 2022 efforts will include three buried ordnance and three 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 bomb damage assessment for the 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 2022 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 for user interfaces, integrate BDA analysis tools with existing JTCG/ME weaponeering applications, shape BDA reporting standards, Landuse Classification, 3D Point Cloud Model Development, Physical Damage Assessment and Building Extraction Tool.</p> <p>- Develop, field, and maintain/support Joint Anti-air Combat Effectiveness (J-ACE) v5.4, 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. J-ACE v5.4 enhancements include: User Support/Training - increased v5.3 training, using unclassified web, updating BROWSE</p>			

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2023 Operational Test and Evaluation, Defense		<b>Date:</b> April 2022
<b>Appropriation/Budget Activity</b> 0460 / 6	<b>R-1 Program Element (Number/Name)</b> PE 0605131OTE / <i>Live Fire Test and Evaluation (LFT&amp;E)</i>	<b>Project (Number/Name)</b> 000311 / <i>LFT&amp;E</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023</b>
<p>documentation resource, Models/Data - new national Time-Space-Position Info (TSPI) format, and Integration - Updated blue AIM-120 and AIM-9x simulations.</p> <p>- Continue integration of Air Combat Effectiveness Library (ACEL) v1.0 capabilities in J-ACE v6.0, which includes Joint Aircraft Survivability Program Survivability and Lethality of Aircraft in Tactical Environments (SLATE) capabilities for Rotary Wing and Low Altitude Combat Weapons.</p> <p>- Continue Cyber JMEM development capabilities with continued execution of multiyear plan to develop/enhance the Cyber Operations Lethality and Effectiveness (COLE) tool. FY 2022 efforts will focus on completion of COLE v2.0 that will include automated fusion of multi-domain estimates, correlation of foundational data to support Operational Environment Model (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.</p> <p>- Develop and field Joint Laser Weaponing Software (JLaWS) tool v2.0 including JTCG/ME Endgame Framework integration, integrate Laboratory/field effects testing and vulnerability analyses. Develop and field High Power Microwave Weapon Systems (HPMWS) v1.0 include continuing HPM lethality testing/target vulnerability analysis/data collection for V&amp;V on service-specific target sets, field-testing, target vulnerability characterization and modeling to provide inputs to JMEM models.</p> <p>- Continue to develop and mature EMS Fires JMEM program and capabilities. FY 2022 efforts will enhance Electronic Attack (EA) effectiveness capability including standardization of data and methods (e.g., approved effectiveness library and services) for EA (offensive jamming) effectiveness for use by the Joint force within operational tools and develop capability to determine weaponing effects due to The Global Positioning System (GPS) denial. A particular focus will be the implementation of EA methodologies for an initial Joint Electronic Attack Prediction (JEAP) tool.</p> <p>- Weaponing Tools to Support Strikes in a Contested Maritime Environment. Efforts will enable development of foundational data and analytics based on weaponing-level, engineering-level, collateral damage estimation, and predictive battle damage assessment methodologies. Plans are being developed/executed to establish an interim Maritime Weaponing Guide as well as leveraging efforts on Advanced Ship Survivability Program, Maritime Survivability Library and Maritime Lethality Analysis Tool. JTCG/ME will finalize the program plan for approval. The end state is to deliver an improved weaponing tool capable of producing timely/accurate estimates with current/future kinetic/non-kinetic weapons to include required aimpoints to achieve the desired lethal effect against maritime targets (surface and subsurface).</p>			

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2023 Operational Test and Evaluation, Defense		<b>Date:</b> April 2022		
<b>Appropriation/Budget Activity</b> 0460 / 6	<b>R-1 Program Element (Number/Name)</b> PE 0605131OTE / <i>Live Fire Test and Evaluation (LFT&amp;E)</i>	<b>Project (Number/Name)</b> 000311 / <i>LFT&amp;E</i>		
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023</b>
<p>- Support the Joint Targeting Intelligence (JTI) requirements roadmap as a bridge to the FY 2023 increase. Of the 25 requirements being addressed, 17 are in relation to scaling DIEE to meet the needs of the targeting enterprise.</p> <p><b>FY 2023 Plans:</b> JLF The FY 2023 budget will align with DOT&amp;E's S&amp;T Strategic Plan, National Defense Strategy objectives, and SECDEF priorities. It will support a more lethal force by increasing the accuracy and capability of critical M&amp;S tools to support T&amp;E efficiency and ensure credibility of DOD assessments and weaponizing tools. The FY 2023 program will continuously focus on multi-year initiatives such as Verification, Validation and Accreditation standardization including model uncertainty quantification and experimentation measurement uncertainty, warhead lethality, data analytics, and maritime modeling M&amp;S enhancements. JLF efforts will also resolve survivability and lethality related system design challenges of currently fielded U.S. systems while maintaining awareness of LFT&amp;E challenges across all air, ground, and sea domains. Finally, JLF will continue to lead innovation in LFT&amp;E methods to increase LFT&amp;E efficiency and support rapid fielding.</p> <p>JASP In FY 2023, the JASP will continue work on multi-year RDT&amp;E projects and initiate new projects approved by the JASP PMSG and OSD/DOT&amp;E. The JASP will support the NDS objective to 'Build a More Lethal Force' by developing measures to improve threat situational awareness, defeat near-peer adversary radio frequency and infrared guided threats, and provide quantifiable improvements in digital and hardware-in-the-loop M&amp;S capability and credibility. Improve aircraft force protection by advancing system hardening against kinetic and non-kinetic threats. 'Reform the DoD for Greater Performance and Affordability' by funding the development of more efficient capabilities to development, test and evaluate aircraft survivability against kinetic and non-kinetic threats.</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 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&amp;E.</p> <p>JTCG/ME - Develop and field JWS v3.0 capabilities plugin within JWS/ DIEE v3.0. Specific development events will include Technical Previews 11, 12, and 13 to finish/field JWS v3.0 and transition to JWS v3.1 development. The JWS v3.x architecture allows greater leveraging and sharing of Service based model and simulation capabilities. The new JWS v3.0 plugin/API design allows</p>				

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2023 Operational Test and Evaluation, Defense		<b>Date:</b> April 2022
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<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023</b>
<p>DIEE to call directly into the Tri-service approved weaponeering calculations engine to support full ATD functions (Weaponeering, CDE, TCM) at CCMD level, as well as supporting separate weaponeering analysis for Services and planners all in one product.</p> <ul style="list-style-type: none"> <li>- Continue to enhance JEL capabilities to serve as the foundation of JWS/DIEE v3.x product line Tri-service approved methodology and data. JEL capabilities include new/updated trajectory modeling, new weapon/targets database designs/data and user interfaces, enhanced structural target response and prediction, personnel and ground mobile vulnerability methods, API, and JEL model Smart Book. FY 2023 efforts will include continued development of capabilities, which include collateral effects radii tables, enhanced collateral damage mitigation, new ground mobile target capability/data, and continue evolution of new maritime operational weaponeering tool.</li> <li>- Support requirements collection by hosting JMEM training sessions, OUWG, and User help desk via the Joint Product Information Access System (JPIAS). JTCCG/ME will support approximately 30 training sessions anticipating about 400 students annually. JTCCG/ME will collect User requirements and product use cases, to process and codify in capability needs statements used for planning and JMEM product development. Requirement management tools will track requirements lifecycle through development and completion; provide context to leadership, analysts and developers without breaking flow: and align Requirements activities with current DevSecOps guidance.</li> <li>- Facilitate coalition interoperability and information exchange forums. JTCCG/ME will continue to support/deliver JWS version releases (ROK JWS, JWS v2.4.x for ACGU, JWS for UK) and standalone Probability of Kill Lookup tools to multiple key coalition partners in support of current operations under FMS agreements, as well as continue to migrate to JEL/JWS v3.x concepts. These FMS deliveries complement U.S. interest and capabilities by providing weaponeering and targeting capability to Coalition partners.</li> <li>- Continue to hold information exchange forums under IEA agreements (US-UK IEA 0864 and US-ROK IEA 0585). These exchanges facilitate collaboration on methodologies and efforts of mutual interest in the area of weapons effectiveness/collateral damage estimation for both kinetic and non-kinetic weapons. These IEAs support the 'National Defense Strategy -Strengthen Alliances and Attract New Partners', specifically by supporting Warfighters in achieving weaponeering interoperability.</li> <li>- Use and enhance the JARVIS and JEL processes to supply target vulnerability data, weapons characterization data, weapons effectiveness methodology to operational and acquisition communities. The JTCCG/ME develops and improves data and methodology used as tri-service standards. A focus of FY 2023 efforts is to deliver new materiel and maritime data and methods to JWS and DIEE.</li> <li>- 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</li> </ul>			

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2023 Operational Test and Evaluation, Defense		<b>Date:</b> April 2022
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**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023</b>
<p>have the potential to reduce the number of weapon test articles required and remove labor-intensive activities from weapon testing.</p> <ul style="list-style-type: none"> <li>- Update/execute strategic roadmaps for underlying vulnerability/lethality models used as standards by the tri-service community to better support JMEMs and DOT&amp;E. These roadmaps align JTTCG/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.</li> <li>- Develop/field DIEE v3.1 with JWS 3.x capabilities plugin/API in accordance with Joint Staff policy. Continue to evolve DIEE as an enterprise targeting solution that provides both seamless planning, linkage to various mission planning systems and tools in operational units. Efforts include maturing DIEE/JWS version v3.x with JWS 3.x capabilities linkage, but also maintain and grow connectivity to community capabilities such as JEL, IMEA, CEL, BDA analytical efforts, and other emerging capabilities for all domain targeting. The new JWS v3.0 plugin/API design allows DIEE to call directly into the Tri-service approved weaponeering calculations engine to support full ATD functions (Weaponeering, CDE, TCM) at CCMD level, as well as supporting separate weaponeering analysis for Services and planners all in one product.</li> <li>- 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 DIEE.</li> <li>- Continue to support/deliver reachback 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.</li> <li>- Continue the Enhanced Weaponeering and CDE Program will support improvements in weaponeering and CDE 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. FY 2023 will continue to community collaboration and focus on continuing to leverage data from the multiple tests to enhance, develop, and validate methodology used in JMEM products. Other efforts will include specialized/focused tests based on lessons learned.</li> <li>- Continue BDA of Deliberate and Dynamic Strikes analysis program. FY 2023 efforts include: continue to extraction and analyze strike data events, enhance BDA tools to include automation and integration of 3D models in JWS/DIEE, support BDA reporting standards, field combat damage assessment tool, maintain/support fielded tools, and collect User feedback.</li> </ul>			

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<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023</b>
<p>- Support fielded version of J-ACE v5.4, 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/analytical capabilities that use J-ACE as the underlying analytical engine for underpinning results and enabling air combat TTP development at test and training ranges.</p> <p>- Develop and field J-ACE v6.0. The new J-ACE v6.0 product line will leverage Air Combat Effectiveness Library (ACEL) v1.0 capabilities. The architecture allows for greater leveraging and sharing of Service and Intel community based model and simulation capabilities to include rotary wing, low altitude combat weapons, and high fidelity air-to-air missile modeling capabilities.</p> <p>- Continue enhancement of Cyber JMEM capabilities in new versions of COLE tool. FY 2023 efforts will focus on completion of COLE v3.0 to include new requirements from Operational user community, such as greater automation, pattern of life analysis, User experience, and connection to other JMEMs for greater all domain capability. A focus will continue to be expanding User base and increased User feedback for product enhancement.</p> <p>- Support/maintain JLaWS tool v2.0. Develop and field JLaWS tool v3.0 to include new weapon systems, target vulnerability characterization, and enhancements from continued test and analytical events. Increase connectivity to other JMEMs for greater all domain capability.</p> <p>- Support/maintain HPMWS v1.0. Develop and field HPMWS v2.0 to include enhancements from HPM lethality testing, target vulnerability analysis, and data collection.</p> <p>- Develop/implement EMS Fires (Electronic Attack) JMEM capabilities. FY 2023 efforts will include fielding of initial JEAP tool v1.0, as well as continue to maintain/refine EA effectiveness (offensive jamming) data standards, collect/approve data, collaborate with User/ Mission Planning community for requirements refinement, and implement convergence and BDA capabilities. These efforts will provide the Joint targeteers and mission planners with standard data sets and methodologies for capabilities analysis/ weaponing and mission planning. The program will also continue to implement validation efforts for GPS analysis capabilities to determine Weaponing effects due to GPS Denial.</p> <p><b>FY 2022 to FY 2023 Increase/Decrease Statement:</b> FY 2023 Weaponing Tools to Support Strikes in a Contested Maritime Environment Increase:</p> <p>The Weaponing Tools to Support Strikes in a Contested Maritime Environment initiative will enable the ability to bring Joint Fires to bear in a maritime action by providing a joint-service approved, scene-based Maritime Operational Weaponing Tool</p>			

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<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023</b>
<p>that can assess weapons effects and optimize weapon allocation. Funding will used to achieve the following: (1) Development of appropriate weaponeering prediction models (JMEmS for maritime threats), (2) Delivery of critical data to improve lethal effect estimate methodologies, (3) Development of target geometry models for prioritized surface and subsurface maritime targets, (4) Development of weaponeering-level, engineering-level, collateral damage estimation, and predictive battle damage assessment methodologies required by Strike Approval Authorities to make their strike decision calls, and (5) Improvement of supporting engineering models to analyze weapon effectiveness, weapon characteristics, delivery accuracy, reliability, and target vulnerabilities.</p> <p>This initiative will increase force-wide lethality by providing Combatant Commanders with improved capability to plan and execute missions in a contested maritime environment. It will deliver a weaponeering tool capable of timely and accurate estimates with current and future kinetic/non-kinetic weapons and the required aim points to achieve the desired lethal effect against maritime targets (surface and subsurface). More specifically, this enhancement will enable the development of data and analytics based operational tools significantly improving the ability to prosecute high value maritime targets in the INDOPACOM, CENTCOM and EUCOM AORs, while producing salvo tables that will reduce over-allocation of ordnance in an already low-density, high-demand environment.</p> <p>FY 2023 Joint Targeting Intelligence (JTI) Increase:</p> <p>JTCG/ME funding will support investment in Joint Targeting Intelligence (JTI) modernization. JTI is the Joint Staff J2's portion of the Joint Targeting Cycle that selects, analyzes, and prioritizes targets and then assesses the results of the application of military force. JTI drives the operations process of linking desired effects to tasks in order to meet the Commander's objectives. This initiative will align the doctrine/ modernize the architecture that governs targeting with the tools that are used for weaponeering, collateral damage estimation, combat assessment, and munitions effectiveness assessment across the CCMDs and Services.</p> <p>JTI Requirements Definition Package includes 25 requirements for the targeting enterprise to be addressed by selected targeting tools (i.e. Digital Imagery Exploitation Engine (DIEE)/JMEmS Weaponeering System (JWS), Joint Targeting Toolbox (JTT), Modernized Integrated Database (MIDB), and Integrated Munitions Effects Assessment (IMEA)).</p> <p>JTCG/ME, in coordination with Joint Staff J2 and OUSD (I&amp;S), will evolve DIEE/JWS and the DOD's battle damage assessment repository to meet the emerging requirements of the JTI (e.g., Common Data Models in data centric environment), with the goal of providing capabilities to the targeting enterprise that evolve with current technological demands.</p>			
<b>Accomplishments/Planned Programs Subtotals</b>	74.048	68.549	99.947

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**Exhibit R-2A, RDT&E Project Justification:** PB 2023 Operational Test and Evaluation, Defense **Date:** April 2022

<b>Appropriation/Budget Activity</b> 0460 / 6	<b>R-1 Program Element (Number/Name)</b> PE 0605131OTE / <i>Live Fire Test and Evaluation (LFT&amp;E)</i>	<b>Project (Number/Name)</b> 000311 / <i>LFT&amp;E</i>
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	FY 2021	FY 2022
<b>Congressional Add:</b> Program Increase: Lab and Test Range Upgrades	-	35.000
<b>FY 2022 Plans:</b> The program increase will fund Operational Test and Evaluation investments in test infrastructure to demonstrate new capabilities under operationally relevant conditions against realistic threats for lab and test range upgrades in the following: space, electromagnetic spectrum, hypersonics, and targets.		
<b>Congressional Adds Subtotals</b>	-	35.000

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

N/A

**Remarks**

**D. Acquisition Strategy**

N/A